A MANUAL

of

GYNECOLOGY

BY

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WITH 175 ILLUSTRATIONS

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TO THE CLASSES OF THE MEDICAL SCHOOL OF
THE UNIVERSITY OF PENNSYLVANIA, PAST
PRESENT AND FUTURE, THIS BOOK
IS DEDICATED BY THEIR
FELLOW-STUDENT,

THE AUTHOR.

PREFACE

THE author has attempted in this volume, so far as it is possible to do so on the printed page, to present the arrangement of the subject he has used in teaching during the last twenty years. His aim has been to present the subject concisely, accurately and without unnecessary waste of space.

In several sections, notably those on the injuries of childbirth, their consequences, diseases of the breasts and hemorrhage, he has thought it best to consider the subject from the point of view of both the obstetrician and the gynecologist, as the two are so intimately connected that to present it in any other way would be at the expense of thoroughness and clarity.

Throughout the book, an effort has been made to omit unprofitable discussion, and to give to the student, be he graduate or undergraduate, at least one method of treatment which has proven its value, as a basis on which to build as suggested by the individual's own experience.

A special chapter deals with leukorrhea alone, one of the commonest disorders for which a patient consults her physician, and yet one which, because it is a symptom and not usually a primary condition, is too frequently passed over in the discussion of its primary cause.

The operation of dilatation and curettage of the uterus—in the author's opinion is one of the most important, because of its *supposed* minor character—has been given somewhat extended space, being described three times, as its technic varies slightly for different indications.

Illustrations have been placed to make more clear the points about which students have most often questioned the author, and where he believes their presence is an addition to the explanations in the text. No attempt at lavish illustration has been made.

The book is presented with the sincere hope that it may achieve the purpose for which it was written: to give to the medical student a reasonably concise and accurate outline of the subject, and to the busy practitioner the information he may seek, without the need of voluminous reading.

J. C. HIRST.

1823 PINE STREET,
PHILADELPHIA, PA.

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A MANUAL OF GYNECOLOGY

CHAPTER I

NORMAL PELVIC ANATOMY

The female genitalia are divided into (1) *external* and (2) *internal* organs. The external organs are (1) Mons Veneris; (2) Labia majora; (3) Labia minora; (4) Clitoris; (5) Hymen; (6) Vagina, which may properly be included under this head. The internal organs are: (1) The Uterus; (2) The Fallopian tubes and (3) The Ovaries. The following is a brief description of these organs.

THE EXTERNAL GENERATIVE ORGANS

The **mons veneris** is the name given to the fatty cushion resting upon the anterior surface of the symphysis; covered, in the adult, with a more or less profuse growth of hair. In the female the area covered by the hair is triangular, its base corresponding to the upper edge of the symphysis.

The **vulva** is the name given to the structures lying beneath the mons veneris. Its direction is horizontal, when the woman is erect. It varies greatly in appearance, depending particularly upon whether or not the woman has borne children.

The **labia majora** are two elongated, rounded masses of fatty tissue covered by skin extending down on either side of the vulva. They are usually 7 to 8 cm. in length, 2 to 3 cm. wide and 1 to 1.5 cm. thick, becoming narrower and thinner at their lower extremities. They vary in appearance, depending upon the amount of subcutaneous fat. In virgins and nullip-

arous women they are in close approximation, while in women who have borne children, they frequently gape widely. They are analogous to the scrotum in the male.

The **labia minora** are two narrow, triangular folds of tissue, seen between the upper part of the labia majora, when these are separated. They converge anteriorly, surrounding the clitoris, while posteriorly they merge gradually into the labia majora.

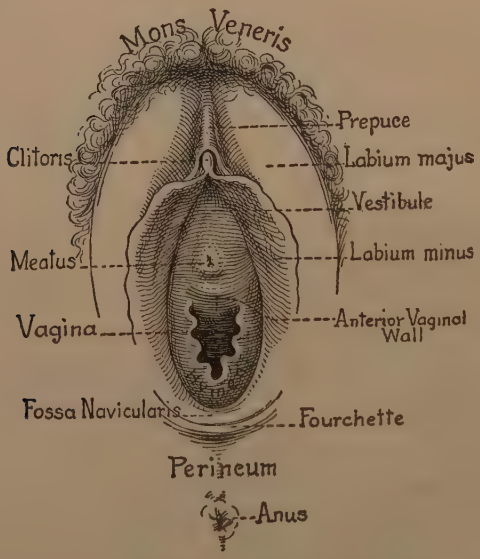

FIG. 1.—Diagram of the external genitalia.

The **clitoris** is analogous to the penis in the male, but differs in having no corpus spongiosum and no urethra. It consists of a glans, a corpus and two crura, and is rarely more than 2 cm. long. Its glans is enclosed by the upper portion of the two labia minora.

The **vestibule** is the almond-shaped area extending from the clitoris to the fourchet, bounded laterally by the labia minora. The portion between the fourchet and the vaginal opening is

called the fossa navicularis, and is usually obliterated by childbirth.

The **vulvovaginal glands,** or Bartholin's glands are two compound racemose glands, about the size of a small bean. They are situated under the constrictor vaginæ, behind the lower portion of the labia majora. Their ducts, 2 cm. long, open on the sides of the vestibule, just outside of the vaginal opening. They are a frequent lurking place of gonorrhea. They are sometimes called the glands of Duverney, who first described them in the cow.

Skene's glands are situated in the floor of the urethra, to either side of the middle line. They are small secretory canals, about half an inch long, whose function is probably that of lubrication. A third, smaller gland is situated in the roof of the urethra. Ordinarily the ducts open through minute orifices inside the meatus, but when inflamed are visible at the meatus. Gonorrhea is practically the only cause of their inflammation.

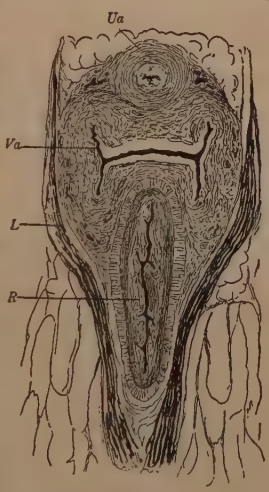

FIG. 2.—Section illustrating the characteristic form of the vaginal cleft: *Ua*, Urethra; *Va*, vagina; *L*, levator ani; *R*, rectum. (*Henle.*)

The **hymen** is the membranous structure which more or less completely occludes the vaginal opening. It presents marked differences of shape and thickness. The most common shape of the hymenal opening is crescentic or circular. The most important of the other forms are the septate, the cribriform and the fimbriated hymen. It is usually ruptured at the first coitus, the ruptures being multiple and most often in the posterior portion. It is usually destroyed by childbirth, the atrophied remains being known as *myrtiform caruncles*. Very rarely it is imperforate. It may also persist unruptured after coitus or even childbirth.

The **vagina** is a musculomembranous canal extending from the vulva to the uterus. It runs through the pelvic floor, and its walls are normally in close apposition. A cross-section of the vagina resembles the letter H. The vagina is about 8 cm. long anteriorly and 10 cm. long posteriorly. The shape of the anterior and posterior walls is triangular, the canal being broadest near the cervix. A prominent longitudinal ridge projects from both the anterior and posterior walls, known as the anterior and posterior vaginal columns. From this ridge, in women who have not borne children, extend numerous transverse folds, known as rugæ. These disappear after repeated childbirth, and the vaginal walls are then frequently smooth. The vagina is lined by a mucosa composed of numerous layers of stratified squamous epithelium. The vaginal mucosa contains no glands. In embryos the vagina is composed of a solid mass of polygonal cells. The vaginal lumen is formed about the third month of fetal life, by the degeneration of these cells.

THE INTERNAL GENERATIVE ORGANS

The **uterus** is a hollow muscular organ, partially covered with peritoneum. It lies in the pelvis, between the bladder and the rectum. Its axis is approximately at right angles to the vagina. It is pear-shaped, slightly flattened anteroposteriorly, and consists of a body and a neck or cervix. The uterus, in the adult female is about two and one-half inches long and weighs about two ounces. The uterus is composed of an inner epithelial layer, a middle muscular layer and, in its upper two-thirds, an outer or peritoneal layer. The inner layer, which lines the cavity, is called the endometrium. It is a thin velvety membrane, about one or two millimeters in thickness, composed of a surface epithelium, a stroma of short spindle cells, and small tubular glands, lined by columnar epithelium. The surface epithelium is a single layer of ciliated columnar epithelial cells. The stroma

contains numerous blood and lymph channels. In the cervix are seen numerous ridges of mucous membrane, radiating from a central ridge, the figure being known as the *arbor vitæ* or *plicæ palmatæ*.

The *uterine muscle*, or the *myometrium*, is composed of bundles of non-striated muscle fibers, united by connective tissue containing many elastic fibers. The arrangement of these bundles is still a matter of dispute. The uterine blood-vessels are very numerous, and pierce the uterine wall in all directions.

The *ligaments of the uterus* are ten in number, viz.: Two broad, two round, two uterosacral, two uterovesical and two cardinal. In the bases of the broad ligments are two bands of dense connective tissue which are often regarded as ligaments of the uterus—the *cardinal ligaments*. They are attached to the supravaginal portion of the cervix. The uterine ligaments are partly suspensory and partly act as guy ropes.

The *blood-vessels of the uterus* are the uterine and ovarian arteries, which anastomose and send numerous branches to the uterus. There is quite free communication between the vessels on the two sides of the uterus. The *veins* form a large plexus around each uterine artery, form the uterine veins and empty into the hypogastric vein. The return blood from the ovary and upper part of the broad ligament is collected by veins which form a large plexus—the *pampiniform plexus*. The vessels from this form the ovarian veins and the ovarian veins empty, the left into the renal; the right, into the inferior vena cava.

The Lymphatics of the Uterus.—The lymphatics of the uterus terminate in different glands. Those from the cervix empty into the hypogastric glands; those from the uterus into the deep lumbar glands, situated in front of the aorta, about the level of the kidney.

The *nerves of the uterus* are derived partly from the third

and fourth sacral nerves, but chiefly from the sympathetic nervous system.

The **Fallopian tubes** are two convoluted muscular canals extending from the uterine cornua through the upper portion of the broad ligaments. They are 12 to 14 cm. long, the left being slightly the longer. They are divided into the *uterine* portion, extending from the cornu to the upper angle of the

FIG. 3.—The arteries of the uterus and ovaries: *O.A.*, Ovarian artery; *b*, artery of the round ligament; *b'*, branch to the tube; *c*, *c*, *c*, branches to the ovary; *d*, continuation of main trunk; *e*, branch to the cornu; *U.A.*, uterine artery; *e*, main trunk; *f*, bifurcation; *g*, vaginal branches; *h*, vaginal branch from the cervical artery. (*Hyrtl.*)

uterine cavity; the *isthmus*, the narrow portion of the tube adjoining the uterus; the *ampulla*, or wider portion of the tube, and the *fimbriated extremity* or abdominal opening. These fimbria are exuberant folds of the lining mucous membrane, and one of them—the ovarian fimbria—extends nearly or quite to the ovary.

The tube is composed of an inner mucous, a middle muscular and an outer peritoneal layer. The lining mucous membrane is composed of a single layer of high columnar ciliated cells, resting upon a thin basement membrane. There is no submucosa. The mucosa is arranged in folds which vary from a comparatively simple arrangement near the uterus to an extraordinarily complex one near the abdominal end. The cilia lash towards the uterine cavity.

The *muscular coat* is composed of two layers of non-striated muscle, an inner circular and an outer longitudinal one. Some of the inner fibers run longitudinally also.

The *caliber of the tube* varies from the uterine end, which will admit a bristle, to the ampulla which admits a fine probe.

The Ovaries.—The ovaries are two almond shaped organs, slightly flattened, lying against a small depression in the posterior surface of the broad ligament, and attached to the ligament by the *mesovarium*. The ovary is of a mother of pearl color, 5 cm. long, 3 cm. broad and 1.5 cm. thick, weighing about 8 grams. The *hilus* of the ovary is that portion of the margin to which is attached the mesovarium.

The *external appearance of the ovary* varies with the age of the woman. In young women its surface resembles mother of pearl, through which show a number of small vesicles—the graafian follicles. In older women the ovary is rough and corrugated, and it atrophies rapidly after the menopause. The ovary is divided into the *medulla* or central portion, which contains the blood-vessels, and the *cortex*, which contains the mature and immature follicles. The blood-supply of the ovary is derived from branches from the ovarian artery. An ordinary Graafian follicle is simply a connective tissue space in the cortex, containing a highly specialized cell—the ovum—and surrounded by a wreath of capillary blood-vessels. A mature Graafian follicle consists of a connective tissue covering—the theca folliculi—; an epithelial lining and the membrana granulosa; the liquor folliculi and the ovum. The

ligaments of the ovary are two in number, the *utero-ovarian* running from the inner side of the hilus to the uterus, and the *infundibulopelvic*, a thin band of fascia running from the outer side of the hilus, just under the top of the broad ligament, to the lateral pelvic fascia.

The **pelvic floor** is composed chiefly of the levator ani, the transversus perinei, superficial and deep, the bulbocavernosus, the anterior and posterior triangular ligaments, the coccygeus and the sphincter ani muscles. The levator ani is far the most important. It consists of two halves, passing back from the anterior pelvic wall and encircling the vagina and rectum. It is a muscular band as broad as the first two joints of the index finger, and is the chief support of the rectum and posterior vaginal wall.

The deep transversus perinei muscle is that portion of the levator ani which has a separate sheath and is inserted in the perineal body in the middle line. It lies between the superficial and deep perineal fascias, or triangular ligament. The anterior triangular ligament is an extension of Colles' fascia.

The bulbocavernosus muscles are in the labia majora and keep the labia in apposition.

The pelvic floor will be more fully discussed in the Chapter on Injuries of the Birth Canal (Chapter XII).

The *lymphatics* of the perineum and lower two-thirds of the vagina empty into the inguinal glands in the groin. Those of the upper one-third of the vagina, cervix and corpus uteri go as already described. There is a possible metastasis in cancer of the fundus uteri to the groin, along the round ligament, which does not exist in cancer of the cervix.

CHAPTER II

METHODS OF EXAMINATION. OFFICE TREATMENT

1. **History Taking.**—It is important to follow a definite plan in taking the history of any patient, and especially so in gynecological cases, because of the intimate relation of symptoms from the pelvic organs to those of the general organism. It should be remembered, however, that the patient's recital of her symptoms is likely to be influenced by her nervous condition, and no attempt should be made to arrive at a diagnosis by the history alone. Its value is partly relative to the results of the pelvic and abdominal examinations. The following points are to be covered routinely: 1. Age. 2. Married or single. 3. If married, how many children; how many living; cause of death. 4. Character of pregnancies. 5. Character of labors; spontaneous; long or short; forceps? Any fever during convalescence? 6. Number of abortions or miscarriages, and at what date of pregnancy they occurred. 7. Beginning of menstruation; interval; pain and when pain is most marked; duration of flow; amount of flow. 8. Leukorrhea? If so, amount? irritating or not? color? how influenced by menstrual flow? 9. If menopause, how long time, and whether any disagreeable symptoms (hot flashes, nervousness, irregular bleeding). 10. Have the patient explain symptoms which led her to consult a physician, and amplify her recital by questions relevant to the complaints (such as backache, headache, constipation, etc.). *Backache* is one of the most common symptoms and should always be asked for. 11. Family history as regards tuberculosis, carcinoma. 12. Questions regarding previous treatment or operations, particularly the latter. 13. Fre-

quency of urination; amount and character of urine passed. 14. Nervous symptoms, if any, such as depression, irritability, worry, sleeplessness, etc.

These are the routine questions in the average history; others are often suggested by the symptoms which caused the patient to seek relief.

EXAMINATION OF PATIENT

1. **Abdominal examination** is best carried out with the patient flat on her back, with knees slightly elevated, to relieve

FIG. 4.—Palpation of the abdomen. (*After B. C. Hirst.*)

tenseness of the abdominal muscles. The corset should be removed, all clothing loosened, and the patient so draped with sheets that there is no unnecessary exposure. Unless the bladder, rectum and sigmoid are empty, a thorough examination cannot be made.

The routine points for examination are:

1. Elasticity of abdominal wall. 2. Diastasis of recti. 3. Both kidneys examined for position and mobility. 4.

Palpation for splanchnoptosis and points of tenderness. The latter particularly over the appendix and both groins. 5. Palpation for any growth, mass, or tumor. 6. Percussion of entire abdomen, to note gastroptosis, dilated stomach, or dullness from growths or ascites. 7. In fat subjects, test thickness of abdominal wall. 8. In abdominal tumors,

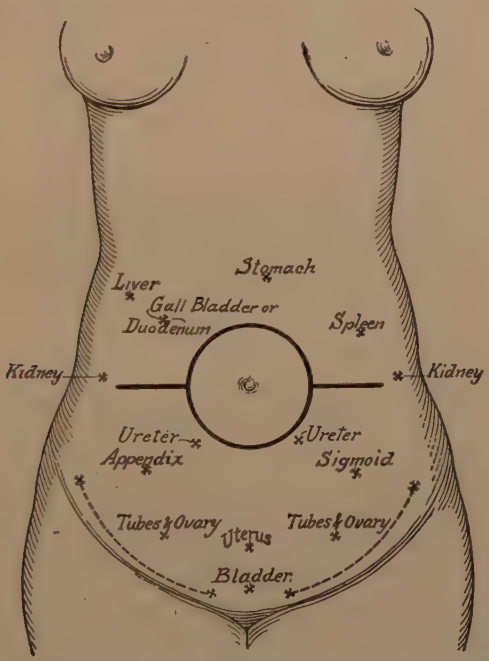

FIG. 5.—Points of tenderness in abdominal examinations, and their probable significance. (*After Crossen.*)

mensuration or measuring is required to determine their rate of growth. The diameters measured are:

1. The greatest girth of the abdomen. 2. The distance from ensiform to umbilicus. 3. The distance from umbilicus to symphysis. 4. The distance between the anterior superior spines of the ilia. 5. The distance between the anterior superior spines of the ilia and the symphysis. 6. The distance

between the anterior superior spines of the ilia and the umbilicus.

Examination of the pelvic organs by palpation is carried out in one of the following positions:

1. *The dorsal or lithotomy position* is the one in which most examinations are made. The patient is arranged on the table on her back, with her hips at the edge of the table. The

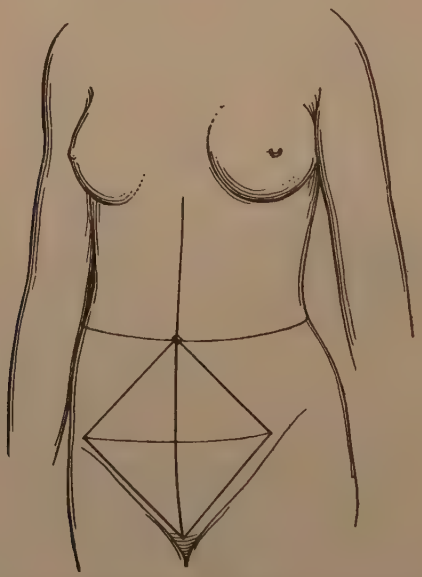

FIG. 6.—Lines for mensuration, to determine the rate of growth of abdominal tumors. (*After B. C. Hirst.*)

thighs are well flexed on the abdomen and the legs on the thighs, and the feet are supported in stirrups or other suitable leg supports. The patient is then so draped in a sheet, that only the mons veneris, external genitalia and part of the buttocks are exposed, avoiding all unnecessary exposure. When possible, the examination is made with the index and middle fingers of the left hand in the vagina, and the right hand is used for counter pressure on the abdomen (bimanual

examination). It is often necessary to use only one finger, on account of a narrow vaginal canal, and in this case the index and not middle finger should be used. In virgins vaginal examination is to be avoided and rectal examination substituted. In making the digital examination of the vagina, care should be taken to avoid pressure on the region around the clitoris and vestibule, causing unnecessary pain. All movements should be gentle, and the use of rubber gloves for all examinations is wise. Glycerin, glycerin jelly or the glycerin

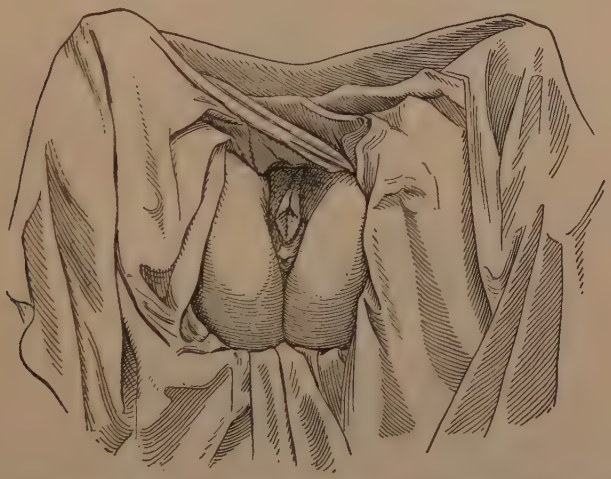

FIG. 7.—Patient draped for vaginal examination in the dorsal or lithotomy position. (*After B. C. Hirst.*)

base unguents dispensed in tubes are all better than vaselin as a lubricant for the examining fingers.

In examining for tubes and ovaries, the hand corresponding to the side examined must be used, *i.e.*, the right hand for the patient's right side, and the left hand for her left. Counter-pressure with the free hand on the corresponding groin is required, but this examination is only satisfactory when the patient is thin and does not resist.

2. *Rectal examination* is often desirable after the ordinary

bimanual vaginal examination, as the patient is already in position for it, and the posterior wall of the uterus and the tubes and ovaries can often be felt better in this way. Rectal examination should always be done in preference to vaginal examination in virgins. The forefinger *only*, protected by a glove, is inserted to its full length in the rectum, and by counter-pressure on the abdomen a surprisingly satisfactory examination can be made.

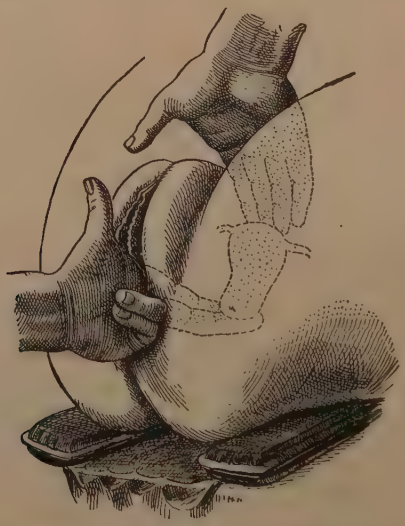

FIG. 8.—Bimanual examination of the uterus. (*After Kelly.*)

3. *Sims' or left lateral position* is used more often in inspection of the cervix and local treatment to the cervix and vagina than in examinations. The patient is placed on her left side, the left leg flexed on the abdomen, the right more so than the left and falling over the left so as to let the right knee touch the table on which she is lying. When the perineum is retracted, the vagina is distended with air, the uterus falls out of the pelvis, and any method of local treatment is thereby facilitated. The position is not adapted for digital examinations.

4. The *genupectoral or knee-chest position* has the same ad-

vantages, though to a greater degree, as the Sims' position. It is not adapted for digital examinations. The patient kneels

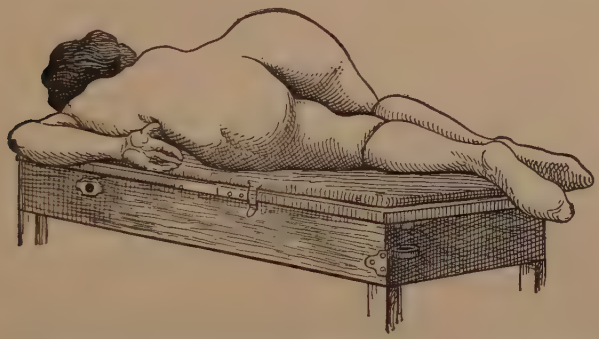

FIG. 9.—Patient in the Sims or left lateral position. (*After B. C. Hirst.*)

upon the table, and leans forward until her chest touches the table, the head being turned to one side. The hips are

FIG 10.—Knee-chest elevated position. (*Ashton.*)

kept as high as possible, and the thighs must be perpendicular to the support on which she is kneeling. The position is.

used chiefly in local treatments of the cervix and posterior vaginal vaults, and to replace a retroverted uterus.

5. The *erect posture* for examination is required to (1) determine the degree of uterine prolapse, which may be masked as the patient lies on her back, particularly if she has been in bed for some days; (2) to determine the fit of a pessary, either for retroversion or prolapse; (3) to detect injuries to the symphysis.

The patient is arranged, standing up, with her skirts pinned up or removed, and draped in a sheet, pinned around her waist so that it falls to the ground, and the edges of the sheet overlap in front. The physician kneels facing the patient, his hand is inserted through the opening between the two edges of the sheet, and the forefinger passed into the vagina. The position is not often required, but is useful for its special indications.

Examinations under anesthesia are required in the following conditions:

1. In young girls. 2. In virgins where on account of resistance rectal examination is unsatisfactory. 3. In any patient too nervous or sensitive to permit a satisfactory examination. 4. In vaginismus. 5. In any case of obscure diagnosis.

The best anesthetic is chloroform, which gives perfect relaxation, and has a minimum of unpleasant after-effects. Only a very small amount is required, as the anesthesia is short. Ether is unpleasant to take and more likely to cause nausea. Nitrous oxid and oxygen would be the ideal anesthesia except for the fact that sufficient relaxation is often difficult to secure.

Very nervous patients, and particularly young girls, should be anesthetized in bed, and not be arranged in position for examination until completely under the anesthetic. In this way, they have no unpleasant memories of the preliminary preparation for the examination.

Aids to Diagnosis.—*Specula.*—The specula required are: (1) Sims', (2) some form of bivalve speculum and (3) a skeleton bivalve speculum. The *Sims' speculum* is most useful in its original form of a single instrument. The double ended specula, designed to provide two different sized specula in the one handle, are often somewhat awkward to use. The speculum is inserted edgewise, with the handle at right angles to the vertical axis of the vulvar orifice, and then turned so that

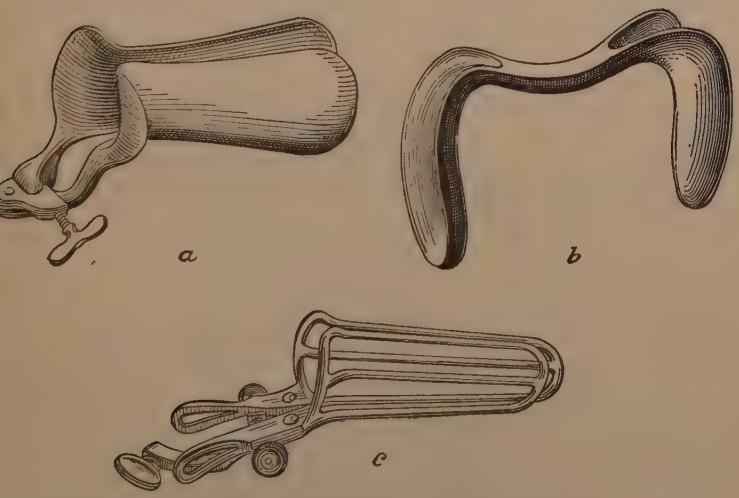

FIG. 11.—*a*, Collin's bivalve speculum; *b*, Sims speculum; *c*, wire bivalve speculum, for exposure of the cervix and vaginal walls.

the handle is directly downward. To give a clear view of the cervix, when the Sims' speculum is used in the dorsal position, a retractor for the anterior vaginal wall is required. This is not necessary in the Sims' or the knee-chest position.

Bivalve Speculum.—The most useful form is the Collin. Two sizes should be provided—for nulliparous and multiparous patients. To insert the speculum, in the dorsal position, a digital examination is made, with one finger, to determine where the cervix is. The vagina does not run straight, in

but downward at an angle of forty-five degrees to the support on which the patient is lying. When the direction of the cer-

FIG. 12.—Sims' speculum. Blades of two sizes in one instrument.

vix is found, the speculum is lubricated, held in the right hand, with its blades closed. The finger used to find the cer-

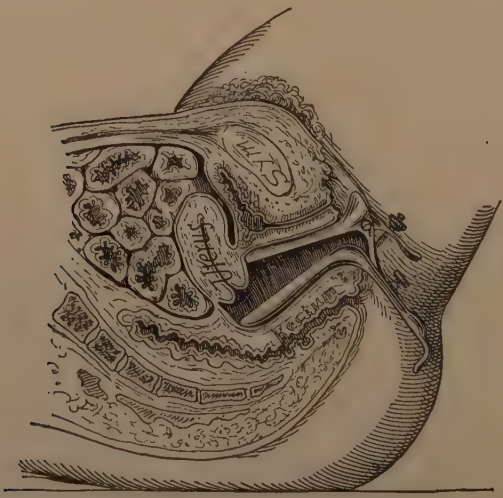

FIG. 13.—Bivalve speculum in position with blades open. The cervix appears between the blades.

vix now pulls the perineum gently downward. The speculum is inserted edgewise, for about one-third of its length; is then

turned transversely and pushed in the direction of the cervix, downward at an angle of forty-five degrees. When inserted its full length, the blades are separated and the cervix should appear between them. Very commonly, nothing appears but the anterior vaginal wall. This means that the angle at which the speculum has been inserted is not steep enough, and the blades should be allowed to collapse, the speculum is slightly withdrawn, re-inserted at a steeper angle, and the blades reopened. The blades can then be held open by a set screw provided on the instrument, and as this type of speculum

FIG. 14.—The commonest mistake in the use of a bivalve speculum. The instrument has been inserted at too slight an angle, and nothing except the anterior vaginal vault appears between the blades.

is self-retaining, both hands of the physician are left free for the necessary treatments.

In removing the speculum, it is withdrawn for about an inch, the blades are allowed to collapse, and it is withdrawn, turning it edgewise as it is taken out. Unless it is slightly withdrawn before allowing the blades to collapse, the cervix is pinched and pulled upon, causing avoidable pain, by pulling on the uterus and broad ligaments.

The *skeleton bivalve speculum* is used in precisely the same way as the solid bladed one. Its advantage is in permitting applications to the vaginal walls, which are of course covered by the solid bladed instrument.

FIG. 15.—B. C. Hirst's double tenacula for the cervix.

FIG. 16.—Thomas' uterine dressing forceps.

Double tenacula or "bullet forceps" are sometimes very useful in the reposition of a retroverted uterus, or in pulling down the uterus to make examination of its posterior wall easier. The small punctures in the cervix, caused by the teeth of the instrument are negligible, but care should be taken

to use a model with sufficient clearance between the blades, so that the cervix is not pinched.

FIG. 17.—Emmet's curet forceps.

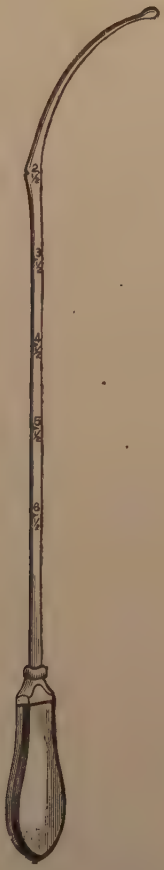

FIG. 18.—Simpson's uterine sound.

Uterine dressing forceps are of two types: The *Thomas uterine applicator*, a narrow bladed instrument used for applications to the cervical canal, or even uterine cavity, and the

Emmet curetment forceps a heavier instrument, to be used when greater solidity and grip are required.

A *uterine repositor*, to be used in replacing a retroverted uterus, is a kidney-shaped ball of metal on a long handle. It is used to pry the uterus forward, assisted by a double tenaculum on the cervix, with the patient in the knee-chest position, by making pressure in the posterior vaginal vault. It is not a necessary instrument, as a pledget of cotton held in the grasp of an Emmett curettement forceps makes a more efficient one.

The *uterine sound* is a long probe, with a flat handle to secure a firm grip, graduated from 0 to 9 inches on the shank. It has been used to determine the direction and length of the uterine cavity, but is fortunately falling more and more into disuse. The less the uterine cavity is invaded, in office work, the safer the patient. When the sound is used it must be inserted by sight, through a bivalve speculum, and after the cervix has been sponged off with an efficient antiseptic solution. It should *never* be inserted by sense of feel.

Artificial light is often required. Reflected light from a head mirror is difficult to control and focus. Specula provided with electric bulbs on the blades are very useful as long as the bulb remains clean and does not blow out, but they cannot be boiled with the bulbs in place. The best light is an electric headlight, with a head band to secure it in place; the current either from the street circuit or a battery.

Sterilization of Instruments.—All instruments must be boiled before and after use. Specula must be warmed before being used, if they have cooled after sterilization, as the touch of cold metal is unpleasant to most patients.

Office Equipment.—*Table.*—A table permitting the dorsal, Sims', knee-chest, sitting and prone positions is essential for satisfactory examinations. A most satisfactory one has a steel frame, adjustable leg supports and is provided with a drainage trough, for fluids used in irrigating and douching. The table is placed where a good *horizontal* light is available.

Vertical light from a skylight without horizontal light from a window is useless.

Sterilizers should be provided for instruments, dressings and water. Combination sets of instrument, dressing and water sterilizers, are the most practical and satisfactory.

An instrument cabinet is most useful, but not essential. The instruments most often required can be kept in the instrument sterlizer, as a container, and used from there.

Rubber gloves for examinations should be used routinely. They are a great protection to both physician and patient.

Artificial light, concentrated in a beam, is often required for inspection of the cervix through a speculum. The best form is a headlight, with forehead band, fed from a battery or street circuit. A pocket flashlight is useful, but a beam reflected from a head mirror is not satisfactory.

Glass jars, to contain pessaries, cotton, tampons, etc., and wide-mouthed glass bottles for solutions such as nitrate of silver, boroglycerid, ichthyol, etc., are essential.

Office Nurse.—It is most desirable that the physician be assisted in his examinations by a nurse, or failing this, a woman who can easily be trained in the management of patients, sterilization of instruments and supplies and as assistant in office treatments. Such an arrangement is most acceptable to his patients, and affords protection to the physician himself.

Instruments required have already been listed under the head of "aids to diagnosis." Other supplies needed will be described under "methods of local treatment."

Electricity is gaining considerable vogue as a method of office treatment, as high frequency, galvanic, faradic or sinusoidal current. A wall cabinet or portable apparatus is a most useful, though a somewhat expensive article of office furniture.

Gynecologic examinations in private houses are very frequently required. It is usually necessary to examine the patient in bed, and for the examination she is arranged across the bed, with her feet on two chairs, and her hips over the edge of the bed. The chairs are arranged facing each other,

with considerable space between them, to give the physician ample room for examination. Should a table be required, one can be improvised out of a kitchen table, with the top suitably padded by a blanket. The patient's knees are held back by a nurse, or can be secured by a rolled sheet, tied above one knee, passing behind the patient's back, over one shoulder and out under the other, and tied above the other knee. Whether

FIG. 19.—Proper way to arrange a patient across the bed for vaginal examination. There is plenty of room, and the chairs are out of the way.

she is in the dorsal position in bed or on the table, the patient is so draped in a sheet that unnecessary exposure is avoided.

For abdominal examination the patient is arranged flat on her back, with the abdomen exposed, but a sheet covering the lower portion of the body and a second sheet or large towel covering the upper portion, so that only the abdomen from the costal arch to the upper margin of the pubic hair is exposed. It is not advisable to try to make abdominal examinations with the abdominal surface covered by a sheet or towel. The

two greatest problems in examinations in private houses are (1) low beds and (2) poor light. The first can be overcome by using a table, though the bed is rarely so low as to interfere much with examinations. If local treatment be required, however, a table is much better.

Sufficient light may be had by a pocket flashlight, or headlight with portable battery, or by having a lamp held by a third person. In emergencies a candle with a large polished

FIG. 20.—Wrong way to arrange a patient across the bed for vaginal examination. The chairs are so close together that there is no room for examination.

spoon held behind it as a reflector, will furnish a surprising amount of light.

METHODS OF LOCAL TREATMENT

Tampons are made of wool; wool and cotton; or all cotton. Those made of wool are decidedly the best. They are designed to apply solutions or powders to the vaginal vaults and

retaining them in place for any desired length of time, usually twenty-four to thirty-six hours. Tampons can be made as required by taking a piece of wool or cotton six inches by three inches, doubling the ends in past the middle, so that they overlap, and tying a piece of string tightly around the mass at the point where the ends overlap. The ends of the string are left about three inches long and tied together so as to form a loop, by which the tampon can be removed after it is inserted. A number should be made up at a time, sterilized, and kept in a glass jar with dust-proof top till required.

FIG. 21.—A wool tampon.

Uses.—Tampons are used chiefly in the following conditions: (1) Erosion of the cervix; (2) moderate pelvic inflammation, with adhesions but without a palpable mass; (3) adherent retroversion of the uterus (to replace by constant pressure); (4) chronic inflammation of the cervix and vagina.

Medication.—Any solution or powder may be used, but those in most common use are: (1) Boroglycerid (a 25 per cent. or 50 per cent. solution of boric acid in glycerin) probably the most useful single application; (2) ichthyol and glycerin, in the strength of 60 per cent. ichthyol and 40 per cent. glycerin; (3) nitrate of silver, in strengths of 4 per cent. to 10 per cent.; (4) boric acid powder; (5) tannic acid powder.

In using these medicaments, it must be remembered that both ichthyol and nitrate of silver will stain the patient's

underclothes indelibly, particularly if an excess of solution be used.

Insertion of Tampons.—The patient is arranged in the dorsal position, and a Sims' or better a bivalve speculum is inserted. A tampon is grasped in a pair of Emmet curetment forceps and thoroughly saturated with the solution to be used. The tampon is inserted in the vagina, through the speculum, and is placed with moderate pressure against the cervix. Two or three other dry tampons are inserted below it, to retain the first one in place. They are held in place as the speculum is removed. The patient is told how many have been used, so a corresponding number can be removed. If it is desired to make considerable pressure, as in a case of adherent retroversion of the uterus, the tampons should be inserted in the knee-chest posture. The patient herself removes the tampons, by the loops of string provided for the purpose on each tampon, at the designated time.

A satisfactory chronologic arrangement for tampons is as follows: The patient comes to the office *Monday* morning and the tampons are inserted. She removes them *Tuesday* morning, takes a douche *Tuesday* morning and evening, and *Wednesday* morning. On *Wednesday* morning, she comes to the office for a fresh supply, which she removes *Thursday* morning. She takes a douche *Thursday* morning and evening, and *Friday* morning. On *Friday* morning she comes to the office for a fresh supply. She removes these on *Saturday* morning, takes a douche Saturday morning and evening, Sunday morning and evening and on *Monday* morning begins the routine again. Usually a course of tampon treatment should last three to four weeks.

Local applications are best made through a bivalve or Ferguson cylindrical speculum. Two methods are available. The solution to be used can be poured in the speculum until the cervix is covered, and the speculum then withdrawn slowly so as to bathe the vaginal walls in the solution. A better and less wasteful method is to apply the solution directly to

the points desired by an applicator wrapped with cotton or a camel's hair brush, through a skeleton wire bivalve speculum.

Indications.—(1) Erosion of the cervix; (2) ulcers on cervix or vaginal walls; (3) patches of acute inflammation of cervix or vaginal walls; (4) diffuse acute or chronic inflammation of cervix or vagina.

The most useful solutions are: (1) Nitrate of silver 40 or 60 grains to the ounce—by far the most useful; (2) pure carbolic acid—neutralized later by application of alcohol; (3) tincture of iodin 5 per cent. or 7 per cent.; (4) ichthyol, either pure or diluted equal parts with glycerin.

If nitrate of silver solution is used, by pouring in through speculum, the patient will often complain of considerable burning. This can be relieved by a douche of salt solution (half an ounce to four pints of water), either in the office or after she has returned home.

Counterirritation to the vaginal vaults of 10 per cent. tincture of iodin is in common use, but of questionable value. As a local disinfectant, in cases of acute gonorrhea or other infection, it has merit, but as a palliative of tubal and pelvic inflammation (the purpose for which it is usually used), it is of doubtful value.

Douching.—The vaginal douche is the most frequently used of all methods of local treatment.

Uses.—(1) As a cleansing agent; (2) to apply antiseptics or astringents in solution; (3) to apply heat.

As in most cases the patient will use the douche herself, and as she is usually uninstructed in its use, the following directions will prove useful.

Directions for Taking a Douche.—1. Always in the recumbent posture, preferably in a bath tub. 2. Use fountain syringe and *never* a forced flow. 3. Boil syringe and nozzle, and use boiled water. 4. Use only mild antiseptics, such as boric acid, 10 grains to the ounce; permanganate 1–3000, and *not* bichlorid or carbolic acid. 5. Have water comfortably hot. *Never* cold. 6. Have syringe not more than two feet above

body. 7. Control flow, so that four quarts will take fifteen minutes to flow through. 8. Use nozzle with blind end, and opening in side. 9. Do not use hot douche just before, during, or just after period.

The water should never be forced in by a bulb or pressure syringe. If the stream from such a syringe should strike the external os, water and leucorrheal discharge might easily be forced in the uterine cavity and thence through the Fallopian tubes into the peritoneal cavity.

Instillations.—In chronic cases, where there has been a long standing infection, gonorrheal or otherwise, it is likely to localize in Skene's glands, Bartholin's glands, the cervical canal or the endometrium. It can only be reached by instillation of antiseptic solutions, or better antiseptic paste, into the affected canals.

Medication.—(1) Nitrate of silver 40 to 60 grains to ounce; (2) carbolic acid and 10 per cent. tincture of iodin, equal parts; (3) ichthyol and glycerin, equal parts; (4) argentide paste 20 per cent. (much the best); (5) in Skene's glands, obliteration by the electric cautery.

Chronic infection of Skene's or Bartholin's glands can be reached by instillation with a hypodermic syringe with blunted needle. The duct of the affected gland is recognized by the reddened areola around it, the needle inserted in the duct and the whole gland injected.

Cervical and intra-uterine instillation requires a Braun syringe, merely a hypodermic syringe with a long metal nozzle.

Technic.—1. A double tenaculum, bivalve speculum and a Braun syringe and nozzle are boiled.

2. The patient is arranged in the dorsal position and the cervix exposed through the bivalve speculum.

3. If necessary, though usually it is not, the anterior lip of the cervix is caught with a double tenaculum.

4. The cervix is sponged off with 1 per cent. formalin solution.

5. The Braun syringe is filled and the nozzle is inserted in

the cervical canal: the internal os for cervical or to the fundus uteri for uterine instillation.

FIG. 22.—Syringe for intra-uterine instillations. Being of metal and glass, it is sterilized by boiling.

6. The contents of the syringe are slowly expelled *as the syringe is being withdrawn.*

This method, as well as that of intra-uterine applications (of iodin or other antiseptics) is not free from danger. With the precautions as indicated above, infection is not to be feared, but in spite of all care, certain patients will suffer severely or even alarmingly from *uterine colic*, with violent pain and severe shock. Should such an accident happen, rest, hot water bag to lower abdomen, hypodermic of morphin gr. $\frac{1}{6}$ and atropin gr. $\frac{1}{150}$, and stimulation are required.

Local blood-letting and the **puncture of Nabothian cysts** are methods of office treatment belonging to the older school of treatment, and rapidly falling into disuse.

Irrigations are required for the urethra, bladder, and occasionally for the uterus.

Urethral irrigations are nearly always done for urethritis of gonorrheal origin, especially the urethritis that persists after the destruction, by cautery, of Skene's glands. The best instrument is Skene's reflux or corrugated catheter, inserted first into the bladder and then pulled back so that the tip is outside the grip of the vesical sphincter, and urine ceases to flow. The catheter is connected with the tube of a fountain syringe and the solution (preferably boracic acid, gr. x to oz. i) is allowed to flow through the catheter and back through the corrugations.

Bladder irrigation is required for chronic cystitis and as a means of distention in con-

tracted bladder. Boracic acid solution (gr. x to oz. 1) is the solution used. It is best introduced into the bladder by a rubber catheter connected to a four-ounce glass or metal funnel. Four or eight ounces of solution are introduced at a time, and then allowed to flow back through the catheter and funnel.

Uterine irrigation is rarely indicated in office work. Considerable dilatation of the cervix is required, and patients requiring uterine irrigation are usually confined to bed. The

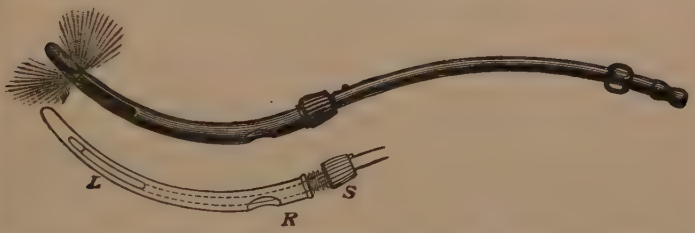

FIG. 23 —Fritsch-Bozemann intra-uterine douche: *L*, Inlet; *R*, outlet; *S*, screw junction.

irrigation is given by means of a Fritsch-Bozemann intra-uterine douche nozzle, connected to a fountain syringe. Not more than two feet elevation of the douchebag is allowable. Sterile water or weak antiseptic solutions (such as boracic acid gr. x to oz. 1; nitrate of silver 1–5000; lysol 1 dram to 4 pints; potassium permanganate 1–3000) should be used. In all irrigations, the temperature of the solution used should be 110°–115°F.

CHAPTER III

ANOMALIES OF DEVELOPMENT. HERMAPHRODITISM. STERILITY

Absence of genital tract is rare, but possible as a whole or in part. If the entire tract is absent there is nothing to be done in the way of treatment; partial absence, as of the vagina, usually requires extensive plastic work, to be described under the heading of Atresia.

Abnormalities of the Hymen.—The hymen is normally a delicate membrane partially occluding the vaginal outlet, with an opening in which the tip of the index finger may be inserted. Its abnormalities are:

1. Double opening (septate hymen). 2. Numerous openings (cribriform hymen). 3. Dentated (irregular edges of opening). 4. Imperforate hymen. 5. Thickened hymen, so dense as to resist coitus.

Occasionally the hymen may be so elastic that it is not ruptured by coitus, or even by delivery of a child. Normally, however, the membrane is ruptured by coitus, and destroyed by childbirth. After delivery, the hymen is represented by small irregular tabs of tissue, called *myrtiform caruncles*. A hymen occluding the vaginal opening or so dense as to be a barrier to coitus, demands excision rather than incision. It is trimmed away with scissors, and the edges of the linear wound coapted by enough sutures, of number one chromic catgut, to control bleeding. The bleeding from rupture of the hymen at coitus is normally negligible, but occasionally it is so profuse as to require one or more ligatures.

The Development of the Genital Tract and its Anomalies.—At the end of the fourth week in embryonal life, the Wolffian bodies are formed. Two weeks later the genital glands cov-

ered with "germinal epithelium," appear just inside the Wolffian bodies. Coincidently there appear two ducts, outside the Wolffian bodies—the Müllerian ducts. The ovaries are developed from the primary genital glands; the entire genital tract, to the vulvar orifice, is developed from the Müllerian ducts.

The Müllerian ducts are at first solid, and only from the ninth week of fetal life on do they acquire lumen. The vagina is still solid, after the uterine cavity is formed. Malformations of the genital tract result from either atresia of one or both Müllerian ducts or a failure of fusion.

About the fifth month of fetal life, the vaginal portion of the uterus—the cervix—is formed. The fundus of the uterus rounds out, and the double cavity disappears. The hymen is formed about this time. The development of glands in the endometrium is late, those of the cervix developing first, but in some instances the glands do not develop before the tenth or twelfth year. At birth, the cervix is much better developed than the uterine body. The retrogression of the Wolffian body and ducts begins at the eighth week and is completed at the sixteenth week of fetal life. The remains of these structures persist in the broad ligament as the *parovarium.*

That portion of the Wolffian duct below the parovarium sometimes persists as a canal, known as Gärtner's duct. Usually only short segments remain, but it has been traced through the uterus, anterior vaginal wall to an opening at the hymen.

Congenital anomalies of the uterus are due to atresia of one or both ducts of Müller, or to their failure of fusion.

1. Uterus didelphys—with double vagina. 2. Uterus duplex bicornis, with double or septate vagina. 3. Uterus duplex bicornis, with single vagina. 4. Uterus bicornis unicollis. 5. Uterus unicornis—where one duct has atrophied. 6. Uterus cordiformis (heart shaped). 7. Uterus incudiformis (flat top, like an anvil). 8. Uterus septus (external form of uterus normal, but cavity divided). 9. Uterus subseptus

(external form of uterus normal, but partial septum in cavity. Normal in horse and ass). 10. Uterus biforis (cervix divided by a septum—normal in the ant-eater).

Double uteri are usually asymmetrically developed, and if pregnancy occurs it is usually in the better developed half—repeated pregnancies occurring in the same half. Pregnancy in a uterus unicornis is usually diagnosed as extra-uterine pregnancy, and the true condition seen only at operation. If the opening of a double or septate uterus is closed, the symptoms and treatment are those of atresia, and will be described under that head.

Defects of Urethra and Bladder.—*Hypospadias* in the female varies from minor defects in the urethra to complete absence of the canal. If the defect is complete, the vesical sphincter is also absent, and operative cure is impossible. In other cases, the defect may be remedied, with fair chance of success, by plastic operation designed to fit the individual case.

Exstrophy of the bladder is the absence of the anterior wall of the bladder, and the anterior abdominal wall covering it. In the upper part of the bladder this is called *superior vesical fissure;* in the lower part, *inferior vesical fissure*, and in the urethra and vulva, *epispadias*. The only relief is by plastic operation, with doubtful success.

Rectum.—The rectum may be imperforate, in which case it must be recognized and treated immediately after birth. *Atresia of the anus* varies from a thin occluding layer of superficial epithelium, which can be easily perforated, to a thick layer of fibrous tissue requiring extensive dissection. The sphincter ani is always present, so complete control is to be expected in successful operations.

Occasionally there is no opening at the anal dimple, but the rectum opens in the vagina, behind the vestibule. This is *anus vestibularis*, and patients with this defect often reach adult life without knowledge of their condition. It may require no treatment, but if operation is indicated, the rectal pouch is brought down to an opening through the anal dimple

and sutured there, and the old vestibular opening is denuded and closed. Complete control is the rule, as the sphincter ani is not disturbed.

Gynatresia.—Atresia of the genital canal may be congenital or (more rarely) acquired; it may be complete from the cervix to the vulva, or may involve either the hymen, vagina or cervix alone. As a result of atresia of the canal the menstrual blood and cervical and uterine mucus cannot escape, and gradually accumulate. Finally the vagina, cervix, uterine

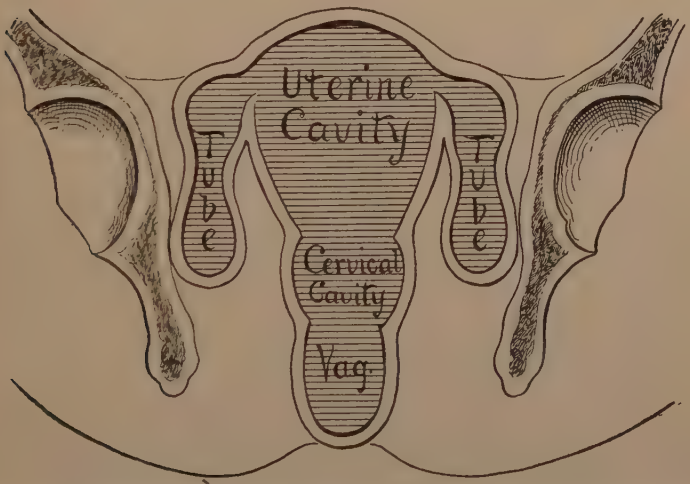

FIG. 24.—Hematocolpos, hematometra, and hematosalpinx caused by an imperforate hymen. (*Ashton.*)

cavity and even the tubes are considerably distended. If the blood is confined to the vagina alone, the condition is called *hematocolpos;* if the uterus alone, *hematometra*, if the vagina and uterine cavity are both involved, *hematocolpometra* or *hemelythrometra;* if the tubes are distended, *hematosalpinx.* The blood is very thick, dark and tarry, and is extraordinarily putrescible when once exposed to the air.

Symptoms.—Rarely if ever occur before puberty. At each menstrual epoch, there are marked menstrual molimina, but

no flow. The patient suffers with intense cramp-like pains, and usually recognizes herself that there is some obstruction to the escape of the menstrual blood. Gradually there develops enlargement of the uterus, which can be felt plainly in the abdominal cavity, and often there are associated symptoms of pelvic inflammation. Usually the tumor of retained blood is so well marked in a few years after puberty that surgical intervention is obviously needed.

Diagnosis.—Usually by attempt at vaginal examination, the point of atresia is at once located. If the hymen, it can be seen to be imperforate and bulged outward as soon as the labia are separated. In this case, the vagina is first distended and only after considerable delay is there dilatation of the cervix and distention of first the cervical canal below the internal os. This gives an hour-glass shape to the uterus, and by rectal examination the uterine body can be felt on top of a cystic tumor. If the atresia is cervical, there is usually a uniform distention of the uterine cavity, which may reach very large size, thinning out the uterine walls like paper. The presence of menstrual molimina, with absence of flow; the obvious atresia on inspection and palpation and the cystic tumor should make the diagnosis easy.

Prognosis.—Operative interference is nearly always required, and is much the safest plan. Spontaneous rupture may occur, either into the peritoneal cavity or through the vagina or hymen. Rupture into the peritoneal cavity is nearly always fatal from peritonitis. Spontaneous rupture through the vagina or hymen is dangerous, because drainage is rarely complete, the retained blood suppurates and there is a high mortality from sepsis.

Treatment.—Before any local measures are attempted, the condition of the Fallopian tubes must be determined by rectal examination or by exploratory section, if the rectal examination is a failure. If the tubes are distended they must be removed as the first step in the operative treatment, because of the danger from peritonitis. The local measures

in the genital canal depend upon the degree of atresia. If the hymen alone is involved, it is best excised. If the vagina is closed, a large urethral sound is placed in the urethra, another in the rectum, as guides, and the vagina opened between them by blunt dissection. If the cervix is involved, a crucial incision is made over the site of the external os, and the opening thoroughly dilated. Then, in any case, the accumulated blood is washed out by persistent irrigation with a *large* uterine catheter and hot saline solution, until the fluid returns clear. Then the entire canal, or as much of it as was dilated by the accumulated blood is packed with iodoform gauze, renewed daily until the canal has resumed its normal proportions.

Rudimentary or absent vagina is usually accompanied by rudimentary internal genitalia, so that, because the uterus is functionless, hematometra does not occur. These individuals often have normal sexual instincts and in case of marriage, an artificial vagina may have to be made. The vaginal canal is made by blunt dissection and lined with epithelium from the labia, split for the purpose. A more dangerous procedure, though more successful, is to bring down, through an opening into the peritoneum, a resected piece of small intestine with its mesentery. The permanent results of artificial vagina, however, are most disappointing; the vast majority contract to a narrow sinus or close altogether.

Hypertrophy of the Genital Organs.—*Hypertrophy of the labia majora* is rare, except as syphilitic elephantiasis. The treatment, if any be required, is amputation.

Hypertrophy of the labia minora is more common, especially in certain races (Hottentots) where the condition is deliberately produced by manipulation. If the labia are inflamed, or interfere with coitus, they are excised.

Hypertrophy of the clitoris is common, and sometimes extreme, reaching a length of three to four inches. If it causes discomfort, it can be amputated, but amputation for nymphomania or masturbation is useless.

Hermaphroditism.—True hermaphroditism, where the individual possesses completely developed and functionating ovarian and testicular tissue, has not been proven in the human being. The true sex is determined by the genital glands (ovaries or testicles), and not by external characteristics.

Pseudohermaphrodite is the proper name for the human species. They are either male or female pseudohermaphrodites, according to which set of glands is developed and functionating.

The female type has the external genitals and secondary sexual characteristics of the male, but has ovarian tissue and at least a rudimentary utĕrus internally. This type is the rarer. The male type has obviously feminine characteristics, but has a rudimentary penis, imperforate urethra or hypospadias, a shallow pouch resembling a vagina, and testicles either undescended or high up in separate scrotal sacs, the scrotum being cleft.

The individual should ordinarily be brought up and educated according to which sexual characteristics predominate; but in cases of doubt "it" should be educated as a boy.

Sterility.—May be either *primary*—in which the patient never has conceived, or *secondary*—where one or more pregnancies have been followed by sterility.

Causes.—In at least 40 per cent. of cases, the fault lies with the male. In the female, the commonest causes are:

1. Anteflexion of the uterus, with cervical stenosis. 2. Pelvic inflammation—endometritis or salpingitis. 3. Retroversion of the uterus. 4. Acquired cervical stenosis—the so-called one-child sterility; usually due to laceration, eversion or erosion. 5. Congenital ill-development or atresia. This includes infantilism (arrested development). 6. Vaginismus.

It is not always possible to determine a cause upon examination; though the influence of the *x*-ray on both testicles and ovaries of those exposed to its effects must not be forgotten. There is also a relationship between adiposity and hypoplasia

of the sexual organs. This is not a constant factor, but it seems to be true that very fat women are less fertile.

Treatment.—Before any treatment of the wife is instituted, the husband should be examined to determine his power of procreation. Obvious physical vigor does not necessarily mean power to procreate. If the husband is pronounced capable, the most frequently required treatment for the wife is a dilatation and curettage—for anteflexion and stenosis. This is done under anesthesia, branched dilators being used to secure a transverse dilatation of one inch. Very little curettage is done—only at each cornu. Excessive or frequently repeated curettage brings about a superinvolution of the uterus which may render the sterility incurable. Unless some means is taken to maintain the dilatation, it is rarely efficient.

Stem pessary is dangerous and liable to be followed by infection; the same may be said of the *Wylie drain*—an aluminum or hard rubber plug worn in the uterus for several weeks following the dilatation; the *Schatz metranoikter*—preferably the four-bladed modification, is the safest procedure. This is left in place for twenty-four hours, is then removed and the uterus washed out. Cases of atresia are managed by the proper restoration of the patency of the canal; retroversion—if not adherent—may be remedied by a pessary or operation; pelvic inflammation requires the cure of the endometritis by intra-uterine instillations or by dilatation and curettage. Salpingitis requires abdominal or vaginal section to inspect and restore the patency of the Fallopian tubes—a procedure of doubtful efficiency. Lack of development—the so-called infantile uterus—requires dilatation *without* curettage, electrical stimulation by the galvanic, (negative pole to uterine sound) rapid faradic and sinusoidal current, and hypodermic injections—intramuscularly— of 1 mil corpus luteum extract, or whole ovarian extract, given daily in series of twelve doses, with an interval of two to three weeks between series.

Sterility of long standing is sometimes relieved spontaneously and without treatment.

Artificial impregnation, by injection of semen into the uterine cavity, by means of an instillating syringe, has been

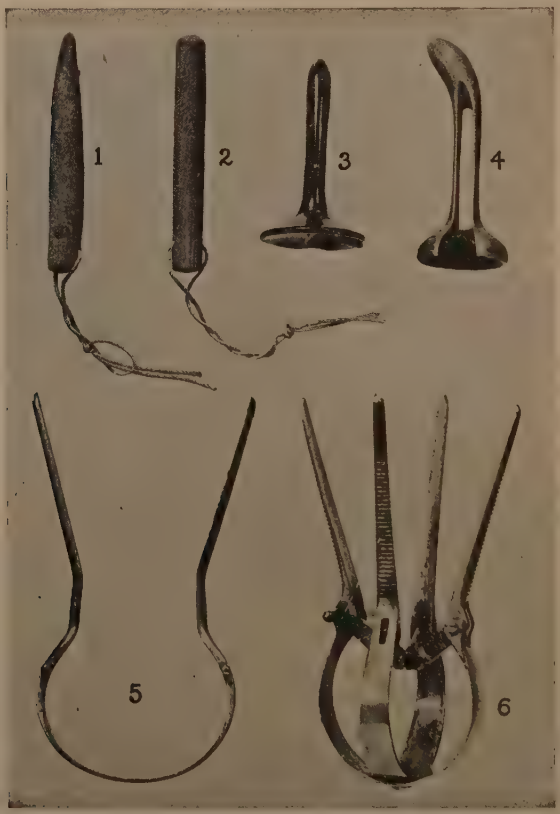

FIG. 25.—Instruments for maintaining dilatation of the cervical canal. 1. Sponge tent, expanding by the absorption of moisture. Impossible properly to sterilize. 2. Tupelo tent of porous wood. Open to same objection. 3. Stem pessary of hard rubber. 4. Wylie drain. 5. Schatz's two-bladed metranoikter. 6, B. C. Hirst's four-bladed modification of the Schatz.

frequently tried, with disappointing results. Only very few successes are recorded and there is considerable risk of infection, due to contamination in handling.

CHAPTER IV

DISEASES OF THE VULVA

1. **Abscess of Bartholin's Gland.**—*Cause.*—Much the commonest cause is *gonorrhea.* Infection by staphylococcus or streptococcus is possible, but much rarer.

Kinds.—1. Pseudo-abscess, where it is the result of an infection of a retention cyst of the gland. 2. *True* or gonor-

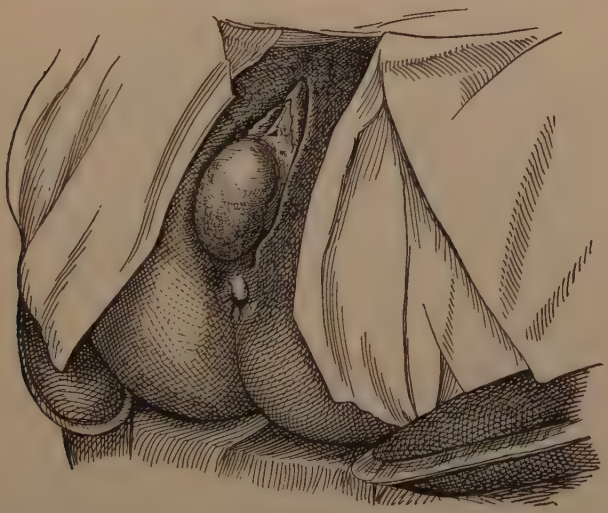

FIG. 26.—Abscess of Bartholin's gland or vulvovaginal abscess.

rheal abscess, where the diplococci have reached the depths of the compound racemose gland or have burrowed under the epithelium of the duct. Nearly all abscesses of the gland are of this type.

Symptoms.—1. Pain, usually severe, and throbbing, with difficulty in walking or sitting down. 2. Distention of the

labium by a pear-shaped, brawny swelling, the base downward, displacing the vulvar cleft to one side. 3. Palpation between thumb and forefinger reveals the swelling and usually fluctuation. 4. Nearly always unilateral.

Differential diagnosis from a simple cyst of Bartholin's gland is easy. The cyst is similar in shape, but is painless, not indurated, much less tense and free from any evidence of inflammation.

Treatment.—1. Opening of the abscess cavity, and swabbing out with tincture of iodin (7 per cent.) or pure carbolic acid, allowing the cavity to fill up by granulation. 2. Excision of the whole gland—much the better treatment. A longitudinal incision is made over the outer edge of the swelling, away from the vulva. The tense gland is dissected out, taking care not to rupture it, if possible. There is always an escape of pus when the finger-like process in the vaginal wall is cut, and here is usually the only bleeding vessel. This vessel is tied, the wound closed with interrupted silkwormgut sutures, leaving an opening at the lower end for a guttapercha tissue drain. Catgut is not a satisfactory suture material, as it is too soon absorbed. The drain is removed in four days, the sutures in ten.

In inflammation of Bartholin's gland, the pre-abscess stage, there are no symptoms, except an area of erosion around the mouth of the duct—the *macule of Saenger*. This is almost pathognomonic of gonorrhea. The treatment is injection of nitrate of silver solution, 40 grains to the ounce, into the duct by a hypodermic syringe with a blunt needle.

2. **Abscess of Skene's Glands.**—These glands, situated in the floor of the urethra, are inflamed only by gonorrhea. The mouths of the ducts are usually not visible, but due to the eversion of the urethral orifice, they are visible, when inflamed, as two red spots with dark centers. By pressure on the urethra, a drop or two of pus can be made to exude.

Treatment.—Destruction of the duct by strong antiseptic solutions or better by an electric cautery needle. Occasionally

the ducts are occluded, and the pus burrows into the tissues of the anterior vaginal wall, forming a swelling not unlike a cystocele in appearance, but brawny and indurated. Pressure on it causes pus to well out of the urethra. Drainage is better secured by a vaginal opening than by opening through the urethra.

3. **Acute Dermatitis of Labia and Perineum.**—*Causes.*—(1) Irritating leukorrhea; (2) lack of cleanliness; (3) transitory

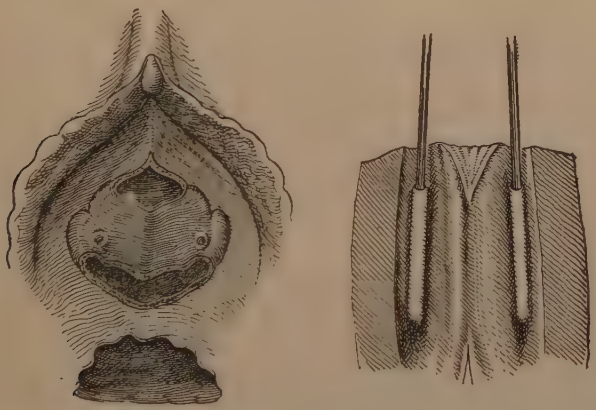

FIG. 27.—Skene's glands or tubules. The urethral meatus is split to show their location.

at each menstrual period; (4) may occur without demonstrable cause.

Symptoms.—(1) The patient complains of severe discomfort, and says she is severely "chafed;" (2) on inspection, the labia are indurated, very sensitive, skin harsh and dry, and this condition extends for some distance on the perineum and inner surface of thighs. The appearance is exactly that of severe sunburn, during the hyperemic and edematous stage.

Treatment.—(1) Correction of whatever cause can be found; (2) avoidance of soap and water cleansing; (3) use of sterile olive or sweet oil for cleansing; (4) local application of:

℞ Acid carbolic ..... gr. xlv
Acid boric ..... ʒiss
Pulv. zinc oxid ..... ʒiii
Glycerin ..... ʒi
Aquæ camphoræ ..... q. s. ad ʒvi
M. Sig. To be applied frequently with absorbent cotton.

4. **Adherent prepuce of clitoris** is most often seen in children where it is a frequent cause of irritation and masturbation. In adult life it is a source of discomfort from retention of smegma.

Diagnosis is easily made by inspection, the prepuce covering the glans as a hood, and being impossible to retract.

Treatment.—The adhesions are easily broken up, using a small metal strabismus hook. The prepuce is retracted daily and the glans oiled to prevent reforming of the adhesions. If they persistently reform, as they often do, circumcision is the only cure.

5. **Chancre of the vulva** is usually situated on the inner surface of the labium. It is similar in appearance to chancre elsewhere and is usually accompanied by mucous patches on the labia and vagina, and often by flat condylomata. If the infection is old, however, the resemblance to epithelioma is close, and may require microscopical examination.

The *treatment* is salvarsan, with iodids and mercury, as in any case of syphilis.

6. **Condylomata** or **venereal warts** are of two kinds: (1) The *pointed*, which are due to dirt or gonorrhea; (2) the *flat*, nearly always associated with mucous patches, and due to syphilis.

Diagnosis.—The *pointed* condylomata are branched papillomata, occurring in patches, over the labia and perineum. Occasionally, most often in pregnancy, they extend in the vagina, even up to and on the cervix. There is usually a serous discharge, irritating, and partially macerating the growths. In pregnancy, they grow enormously.

Flat condylomata are raised flat patches, usually three or

four in a group, occurring on the inner surfaces of the labia and around the anus. They are usually associated with mucous patches and other constitutional signs of syphilis.

Treatment.—Pointed warts should be removed by excision and suture of their bases, or by cautery, if they are pedunculated. Unless very extensive, they can be removed under cocain, but never under ethyl chlorid spray if the cautery is used, as ethyl chlorid is inflammable.

Flat condylomata should be let alone, and constitutional treatment given for syphilis.

7. **Cysts of the labia** may be (1) Bartholin's gland; (2) lymphatic cysts; (3) sebaceous cysts; (4) dermoid cysts. They are all better dissected out than incised and drained. They are usually, except those of Bartholin's gland, pedunculated, and removal is easy.

Solid tumors of the labia are either (1) lipoma; (2) fibroma or (3) sarcoma.

8. **Dyspareunia** (painful coitus) while not a disease of the vulva, may be considered here, as many of its causes are located in the vulva and lower vagina.

Causes.—(1) Rigid hymen; (2) acute inflammatory conditions of vulva, vagina or urethra; (3) vaginismus; (4) hemorrhoids; (5) inflammation or infiltration of the pelvic connective tissue; (6) adherent retroversion of the uterus; (7) salpingitis.

Symptoms are simply pain on coitus, the site of pain being either at the vulvar entrance, or high up in the pelvic canal, in the cases where there is pelvic inflammation or displacement of the uterus. The pain varies from slight discomfort to one of such severity as to make coitus impossible.

Treatment.—As the condition is not a primary one, but always a symptom, the treatment consists in removing the cause. A thick rigid hymen is better excised than incised; vaginismus is overcome by progressive dilatation with Hegar's bougies or better by a bivalve speculum, inserted closed and the blades then widely separated; or by incision of the lower two-thirds of the levator ani on each side; hemorrhoids (a

surprisingly frequent cause) removed by cautery or ligature, and any inflammatory process treated by douches, etc., depending upon its nature.

9. **Elephantiasis** is usually not the true elephantiasis, but a hypertrophy of the labia due most often to syphilis. Pathologically, the picture is one of connective-tissue overgrowth with wide lymph spaces. The growth (except in true elephantiasis, where it may be enormous) is moderate in size, and is most often accompanied by characteristic mucous patches. In all cases, a Wassermann should be taken.

Treatment.—Of the true elephantiasis, excision is the only treatment. The operation is formidable, the bleeding often excessive and difficult to control, even by mass ligatures. Syphilitic elephantiasis will often yield to mixed treatment, salvarsan or neosalvarsan and in many cases operation can be avoided. Obstinate cases require amputation of the labia majora, labia minora and clitoris.

10. **Epithelioma.**—The vulva is the rarest seat of carcinoma of the genital organs. It occurs most often after fifty years of age. The growth is almost always squamous epithelioma, and the most common point of origin is the clitoris. Adenocarcinoma of Bartholin's or Skene's gland is possible, but exceedingly rare. Early and extensive metastasis to the inguinal chain of glands is the rule.

Symptoms.—A small hard nodule appears near the clitoris or one labium majus, and quickly ulcerates. This ulceration spreads rapidly, over the site of the clitoris down both labia majora, and later into the vagina. The surface of the ulcer is friable, bleeds at the slightest touch and exudes a very foul, thin, purulent discharge. In the early stage pain is slight or absent; later the pain is excruciating, and often increased by thrombophlebitis of one or both legs.

Diagnosis should be easy, even in the early stage. In all cases a piece of the growth resected and examined microscopically will establish the diagnosis.

Treatment.—Early, complete and radical excision offers the

only hope of cure, and at best a poor one. The inguinal glands must always be excised, and all suspicious tissue removed. Many cases are seen too late for operation, because of the early metastasis. After operation, all cases should be treated by *x*-ray or radium, and the percentage of recurrence is very high. For inoperable cases or for recurrence after operation, radium offers the best chance of relief.

11. **Sarcoma of the vulva** is much rarer than epithelioma. Its point of origin is most often the labium minus and it is most often melanotic. Diagnosis and treatment is the same as epithelioma, but almost invariably it returns as a diffuse sarcomatosis. Other solid tumors of the vulva, such as fibroma or lipoma, are rare. They are found almost exclusively in the labia majora, and frequently pedunculated, painless, and demand removal because of the discomfort of their presence, or more particularly because of their tendency to malignant degeneration.

12. **Inflammation of the vulva** (vulvitis) is rare, except in children, because of the resistance of the surface epithelium to infection. In children, gonorrhea is the most common cause; in adults, vulvitis is usually secondary to inflammation higher in the genital tract, is the result of irritating discharge of pus or urine, or is due to trauma.

Symptoms.—The vulvar mucosa, especially that of the labia minora, is red and edematous. There is marked discomfort in walking, sitting down, or in handling the parts. There is considerable sero-purulent discharge, most profuse in gonorrheal cases. In the acute cases, pain is the most marked symptom; as the acute stage passes, there is often an intolerable itching. As a result of desquamation, especially in children, adhesion of the labia is a common complication.

Treatment.—The treatment of gonorrheal vulvitis is given in the chapter on gonorrhea in general. The treatment of non-gonorrheal vulvitis is: (1) Cleanliness—the best cleansing solutions being either boric acid solution (grains ten to one ounce) or lysol, half a dram to two pints. The vulva should

be thoroughly cleansed at least four times daily; (2) the treatment of any cause that may be present, such as an irritating leukorrhea, or leakage of diabetic urine, or urine from a fistula; (3) antiseptic or astringent solutions such as: nitrate of silver, grains ten to one ounce; zinc sulphate, two drams to two pints of water; solution of formalin, ¼ of 1 per cent.; argyrol solution 10 per cent.; or, which has given the best results, the prescription given under the head of acute dermatitis of labia. Vulvitis in the adult is often a very stubborn condition, and occasionally persists for years. If the labia show a tendency to adhere along their inner surfaces, liberal use of boric acid ointment on the abraded surfaces will prevent their adhesion.

13. **Kraurosis vulvæ,** or sclerosis of the vulvar skin, is the result of a long-continued irritation, either from discharge or pruritus. The skin becomes white, hard and parchment like, and the patient suffers severely from excessive itching. No local treatment has been of any avail. Several cures have been reported from the use of ovarian extract (due possibly to improvement of the circulation of the external genitals), by mouth 5 grains four times daily, or better hypodermically as the whole ovary extract (1 mil representing 20 mg. of ovary, given once daily). Amputation of the external genitalia is not satisfactory, owing to the frequent recurrence of the itching in the scar, so that the patient is just as uncomfortable as before. Resection of the five pairs of sensory nerves supplying the vulva is the best surgical treatment; it is a difficult and tedious dissection, but worth while. From long-continued irritation, epithelioma is a frequent sequel of both kraurosis and pruritus.

14. **Lupus vulvæ** is tubercular ulceration of the vulva and is rare. It occurs most often in the decade of thirty to forty years of age, and is supposed to be secondary to tubercular focus elsewhere, and rarely primary. The ulcer may be very extensive, is covered by a gray slough, and has feebly nourished granulation tissue. There is a tendency to spontaneous

healing in the older portions of the growth, which will distinguish it from cancer. The growth has a marked tendency to involve the anterior vaginal wall and cause vesicovaginal fistula. A positive diagnosis can only be made by excision of portions of the growth and microscopical examination.

Treatment is the same as lupus elsewhere. Curettage of the surface, *x*-ray for fifteen to twenty minutes daily or Finsen light for one hour every other day, a small area being treated at a time, will give the best results. If the ulcer is primary, prognosis is good, though the cicatrix will be extensive. If it is associated with tuberculosis elsewhere, the prognosis is bad. Vesicovaginal fistulæ resulting from lupus cannot be closed, and any attempt at repair will only result in making the fistula larger.

15. **Pruritus vulvæ**, characterized by an intense itching of the vulvar and perineal skin, usually accompanied by sclerotic changes in the skin, but not infrequently without any visible lesion. It is a forerunner of kraurosis, and these two must be considered different stages of the same pathologic process, there being no marked dividing line between them.

Causes.—(1) Diabetes—the skin change being produced by chemical action of the irritating urine; (2) dirt and parasites; (3) irritating leukorrheal discharge from gonorrhea, sloughing polyps, cancer or endocervicitis; (4) senile atrophy—postmenopause—of the vaginal and vulvar mucosa; (5) partial atresia of the vagina or cervix; (6) neurotic cases, where no obvious cause can be assigned.

Symptoms.—The skin is at first reddened and thickened, and there is intense burning and itching. The skin gradually becomes paler and more parchment-like, and numerous fissures appear. This stage progresses until kraurosis develops. Many cases have only the violent itching, without demonstrable change in the skin.

Treatment.—Pruritus is essentially a symptom, and the treatment must therefore be directed toward removing the cause. As diabetes is the commonest cause, the urine of every

patient should be at once examined for sugar; and the patient put upon appropriate treatment, if sugar is present. The remedy for dirt or parasites is obvious—cleanliness and shaving of the pubic hair, followed by frequent washing with watery solutions of tincture of green soap two ounces to one pint of water, and sponging with lysol solution one dram to one pint of water will give the quickest result.

Leukorrheal discharge is controlled by removing the cause, if one can be found, and the discharge is kept from contact with the vulvar mucosa by vaginal tampons with 50 per cent. ichthyol or boroglycerid 25 per cent. The discharge from senile vaginitis is best controlled by painting the vaginal mucosa with 7 per cent. tincture of iodin.

Partial atresia is dilated to afford freer drainage, the dilatation being repeated at intervals, as the atresia tends to recur.

Local applications are usually disappointing or at most give temporary relief. Cocain solution 1 to 10 per cent.; carbolic acid ½ of 1 per cent. to 2 per cent. solutions; nitrate of silver 40 grains to the ounce; menthol in stick form; ichthyol 50 per cent. in glycerin; injection of the sensory nerves with novocain solution ¼ of 1 per cent.; alcohol 95 per cent. with 1 grain of bichlorid of mercury to the ounce; tincture of hamamelis full strength; formalin 1 per cent. are the ones offering the best chance of relief, but none of them can be depended upon for more than temporary benefit. The author has found the prescription given under the heading of acute dermatitis of the vulva, the most valuable of all local applications.

The diet must be regulated; all highly spiced foods, tea, coffee and alcohol forbidden.

X-ray treatments are much more valuable, and give a high percentage of cures. Radium is not so efficient, on account of the wide area to be treated. Ovarian extract gr. v four times daily, or 1 mil hypodermically of the soluble extract of whole ovary, given once daily is worth a trial.

Surgical Treatment.—Obstinate cases, with marked skin changes, or those of the neurotic type where the itching per-

sists, although no demonstrable lesion exists, will not yield to any form of local application, but will require one of two surgical procedures. (1) Vulvectomy or amputation of the external genitalia. This is unsatisfactory, as the itching often persists in its former intensity in the scar, and the patient is just as wretched as before. (2) Resection of the five pairs of sensory nerves supplying the vulva—(1) genital branch of genitocrural; (2) ilio-inguinal; (3) inferior pudendal; (4) perineal branches of the pudic; (5) dorsal nerve of clitoris. Simple section of the nerves is not enough; as long a piece as possible must be resected. The first two are found in the inguinal canal; the last three in the perineum—the perineal incision paralleling the descending ramus of the pubis. The dissection is difficult and tedious, but the results justify it.

16. **Pudendal hernia** is analogous to scrotal hernia in the male, the gut or omentum descending along the inguinal canal into the labium.

17. **Urethral Caruncle.** *Definition.*—A blood-red, flattened, usually pedunculated tumor, hanging from the posterior lip of the urethra. The pathological picture is usually *angioneuroma.* The painless type, which is rare, is angioma simplex, and is usually sessile.

Symptoms.—(1) Agonizing pain, especially on urination. The slightest touch is unbearable. (2) Inspection shows the characteristic growth which is usually single and pedunculated. The sessile painless variety gives no symptoms, the patient being usually unaware of its existence until it is found in the course of a vaginal examination.

Treatment.—Excision of the growth, *with its base*, under general anesthesia, and preferably with the cautery. Removal under local anesthesia is not as satisfactory, nor is the attempted destruction of the growth with the electric needle to be recommended. Recurrence is common, especially after removal under local anesthesia.

The sessile, painless type need not be removed, unless it shows evidence of increasing in size.

18. **Urethral prolapse** is most common in old age, and due to senile atrophy. Moderate cases simulate the sessile type of urethral caruncle, and are simple ectropion or eversion. Severe cases are not unlike cancer in appearance, especially if thrombotic. While the condition is most common in advanced life, it may occur at any age.

Moderate cases do not give much if any discomfort and require no treatment. Severe cases require removal of the prolapsed mucosa, after the manner of the Whitehead operation for hemorrhoids.

19. **Varicose veins of the vulva** (varicocele) are usually negligible except in pregnancy. Then they may form a considerable mass, but after delivery they disappear completely or remain simply as one or two visibly dilated veins, usually near the clitoris.

Except in pregnancy, they rarely give symptoms unless thrombosed.

Diagnosis is easy. Inspection shows the tortuous mass of veins.

Treatment.—Rest in bed, knee-chest posture for fifteen to thirty minutes four times daily and moderate pressure with a vulvar pad will control moderate cases. The danger is subcutaneous or open rupture. Subcutaneous rupture gives a huge hematoma; open rupture causes dangerous and even fatal hemorrhage. The patient should be instructed how to make pressure on the mass of veins, in the event of rupture. The bleeding is finally controlled by undersewing and ligation of the veins. A hematoma must be widely opened, to give access to the bleeding points.

CHAPTER V

DISEASES OF THE VAGINA, EXCLUDING LACERATIONS AND THEIR CONSEQUENCES

1. **Absence** of the vagina is rare. Congenital absence is associated with rudimentary internal genital organs, and the uterus is functionless. Apparent absence may be the result of atresia of a part or whole of the vaginal canal. Congenital absence gives no discomfort and patients are unaware of the condition, until the absence of menstruation causes them to seek advice. Atresia of the vagina with apparent absence of the canal causes retention of the menstrual blood at puberty, and its attendant symptoms.

Congenital absence of the vagina requires no treatment, unless the patient is to be married and desires the formation of an artificial vagina. This is done by blunt dissection between the bladder and rectum to the depth of the normal vagina, and the raw surfaces are covered by epithelium turned in from the labia or buttocks. A better, but more dangerous plan, is to bring down through an opening in the peritoneal cavity, a resected piece of small intestine, with its section of mesentery. Both plans are difficult, and the artificial pouch is very likely to close, in spite of all efforts to preserve its lumen.

2. **Atresia of the vagina,** congenital and acquired, is treated in Chapter III.

3. **Carcinoma** of the vagina is rare, as a *primary* growth. *Secondary* cancer of the vagina is very common, being metastatic from the uterus, rectum and bladder in the order named.

Primary carcinoma is almost always squamous epithelioma, but very rarely may be adenocarcinoma from congenital cysts or gland inclusions. The commonest site is on the posterior vaginal wall. *Chorionepithelioma* may rarely be primary in the vagina; usually it is metastatic from the uterus.

Secondary carcinoma, being usually metastatic from the cervix, is most commonly situated in the upper third of the vagina.

Symptoms.—The growth is at first a circumscribed nodule, surrounded by a raised indurated ring. The area spreads slowly, ulceration and bleeding occur early, and a foul seropurulent discharge appears. Any doubt as to the nature of the growth can be settled by excision of a piece and microscopical examination.

Prognosis is very bad, and even after early extirpation recurrences are the rule.

Treatment.—If the case is seen early enough, total extirpation of the uterus and vagina is required. If the site of the growth is high up, the extended Wertheim operation is the best. If the growth is near the outlet, the lower portion of the vagina can be freed from below, and the operation completed by abdominal extirpation.

If the rectum is involved, it also must be removed and an artificial anus made by inguinal colostomy.

Metastasis.—In the lower third of the vagina, the direction of metastasis is to the inguinal glands, rectum and bladder. In the upper two-thirds, metastasis takes place to the cervix, rectum, bladder, deep sacral, lumbar and renal glands; and rarely to the groin.

Inoperable cases are best treated by radium. *X*-ray has proved disappointing. Pain, which is often severe, must be controlled by morphin or codein hypodermically. Most cases are seen too late for radical operation. *Any indurated vaginal nodule, especially one with ulceration of its surface, should be at once excised and examined microscopically.*

4. **Condylomata** of the vagina are rare, and usually associated with vulvar growths. The warts are pink, covered by normal epithelium, not ulcerated, do not bleed when touched and can be differentiated at sight from carcinoma.

Treatment is removal by ligature or cautery, under general

anesthesia. They do not tend to recur, provided the patient keeps herself clean.

5. **Cysts** of the vagina are of three kinds:

1. *Cysts of Gärtner's duct*, found in the anterior vaginal wall. They are thick-walled, contain a thick viscid fluid. They may be so large as to give the appearance of a cystocele.

2. *Lymphatic cysts*, found anywhere on the vaginal walls. They are thin-walled, look like large blisters, and contain a thin serum.

3. *Epithelial cysts*, due to buried epithelium from faulty denudation in a plastic operation. These are at the introitus or in the vaginal sulci. They vary in size from a pea to a walnut and contain a thick sebaceous creamy fluid, erroneously described as "pus." These cysts usually cause discomfort, especially those at the introitus.

Symptoms are usually absent, except in the epithelial kind, which often cause pain, especially in coitus.

Diagnosis is usually easy. Cysts of Gärtner's duct look not unlike cystocele, but do not bulge on straining. Lymphatic cysts and epithelial cysts are unmistakable.

Treatment is operative. Simple puncture is enough for the lymphatic cysts. Epithelial cysts are dissected out and their bed obliterated by one or two sutures. Gärtner's duct cysts can be shelled out by blunt dissection, if they are small. There is some danger of injury to the bladder or urethra. The larger cysts of Gärtner's duct often extend into the layers of the broad ligament, and their removal is a formidable procedure.

6. **Fistula,** including anus vestibularis, are described in Chapter XV.

7. **Foreign bodies** in the vagina are most often pessaries, inserted and forgotten. Almost any object of suitable size has been inserted by insane women or masturbators. A forgotten pessary is likely to erode its way into the bladder, rectum and vaginal vaults. In any case of foul vaginal discharge, a pessary or other foreign body must be sought for as a possible

cause. In such a case, removal of the offending body and astringent douches for one or two weeks is all that is required, provided the bladder or rectum have not been injured.

8. **Garrulitas vaginæ** is the audible escape of gas from the vagina, following exertion or rapid change of position. The cause is incomplete closure of the introitus, due to laceration of the deep and superficial transversus perinei muscles, and the cure is a plastic operation.

9. **Septum formation** in the vagina, dividing the canal into two partially or entirely separate canals, is not uncommon. Septa give no symptoms; are found accidentally in gynecological examinations. In labor they are commonly torn loose at one end, and can then be ligated and amputated.

10. **Tuberculosis** of the vagina is rare. As a primary condition, it is seen usually in children. In adults it is secondary to lupus vulvæ. It shows itself by ragged ulceration, covered by pale edematous granulations, showing some tendency to heal at the edges, and, in the adult form, a marked tendency to form vesicovaginal fistula.

It is treated by *x*-ray, radium or Finsen light. Local applications have no effect. Vesicovaginal or rectovaginal fistulæ due to tuberculosis cannot be closed.

11. **Tumors.**—Fibromyomata and myomata of the vagina are rare. They arise from the muscle of the vaginal wall. They are usually small, pedunculated, and are especially prone to slough. The site is most often the posterior vaginal wall. Their commonest degenerations are necrosis, sloughing and sarcoma.

Treatment is removal, which is usually easy. If they are diffuse and sessile, they may require extensive dissection. This type is usually adenomyoma.

12. **Vaginismus** is the name given to a spasm of the levator ani and other pelvic floor muscles, provoked by attempts at coitus, examination or the insertion of any instrument into the vagina.

True vaginismus is that due entirely to psychic reflex, without any exciting cause.

Pseudovaginismus is that due to some painful affection such as urethral caruncle, rigid hymen, excessive perineal repair, vaginal ulcers, abscess of Bartholin's glands, etc.; the spasm disappearing when the cause is removed.

In true vaginismus the muscular spasm is often shown before the parts are actually touched, while in pseudovaginismus it is the actual contact that causes the spasm and the lesion causing it is usually obvious. In the former, no lesion or cause can be found.

Diagnosis.—It is not always easy to differentiate between true and false vaginismus. A careful digital and specular examination of the genital canal is necessary, and this nearly always calls for an anesthetic. The cervix is examined for erosion, the vaginal vaults for the induration of cellulitis, the anterior vaginal walls and urethra for urethral caruncles, abscess of Skene's glands and suburethral abscess, the posterior vaginal walls for fissure; the introitus for rigid hymen, abscess of Bartholin's gland or vulvitis. If the case is one of pseudovaginismus, the exciting cause can often be found and removed at this examination. If no cause can be found, the case can be classed as true vaginismus. Any examination without anesthesia must be conducted with great gentleness, as undue roughness or impatience often aggravates the trouble.

Treatment.—If there is an obvious cause, the removal of the offending lesion will give prompt relief.

In *true vaginismus* one of several plans of treatment may be required.

1. The *Walthard* method, depending upon the theory of antagonism of the abdominal muscles to those of the pelvis. By causing the patient to strain and bear down strongly, the muscles of the perineum are deadened, so that the finger can be introduced into the vagina, and the patient, realizing that no pain was caused, loses her fear of being hurt and the vaginismus

disappears. This will succeed in a small minority of patients, and is worth a trial.

2. *Gradual dilatation* of the vagina by means of a bivalve speculum introduced and the blades separated as widely as possible, until the pressure is uncomfortable. A better plan is the use of Hegar's graduated bougies, loaned to the patient, who inserts daily successive sizes, as she can bear the increased pressure, leaving each in place, in the vagina, for an hour, while she rests in bed. Usually in several weeks they have secured sufficient dilatation, so that they are no longer needed.

3. *Obstinate cases* require incision of the perineal body, in the middle line, half way to the anus, and also incision of each sulcus about an inch in depth, so that the appearance is that of a double sulcus tear in labor. Sutures are then inserted from above downward, converting the Y-shaped incision into a transverse line, and causing a gaping vulvar orifice.

4. In all cases of true and pseudovaginismus, ovarian extract, either by mouth gr. v four times a day, or preferably hypodermically 1 mil daily for 24 doses, is of distinct value.

13. **Vaginitis (Colpitis): Inflammation of the Vagina.**—The vagina, considering the provocation to infection, is comparatively immune during adult life, due to the protection of its squamous epithelium covering (really a modified skin) and to the acid secretion (lactic acid, secreted by Döderlein's bacillus) that inhibits the growth of many pathogenic bacteria. In childhood vaginitis, especially the gonorrheal type, is much more common. In adult life, vaginitis without a preliminary mechanical or chemical injury to the surface epithelium, is rare. In the senile type, past the menopause, it occurs in patches, giving the characteristic mottled appearance.

Kinds.—(1) *Diffuse granular*, most common in gonorrhea; (2) *Senile*—in patches varying from a pinhead to one or two centimeters in width; (3) *Mycotic*—due most often to thrush fungus, leptothrix or *Oïdium albicans*. Diabetic urine distinctly favors the growth of fungi. (4) *Emphysematous*, with

formation of gas vesicles in the mucosa, seen most often in pregnancy. (5) *Acute septic*, seen in puerperal infection.

In any kind of vaginitis, but most often in the senile type, desquamation of the surface may occur, and possibly cause adhesion of the opposing vaginal surfaces. In this way are formed most of the partial or complete atresias of the vagina.

Causes.—(1) Gonorrhea—the cause of most cases of acute vaginitis; (2) senile atrophy; (3) long-standing irritating cervical or uterine leukorrhea—causing chemical injury to the surface epithelium; (4) neglected pessaries or tampons—causing mechanical injury; (5) infectious diseases like typhoid, small-pox and diphtheria; (6) puerperal fever; (7) fungi of various kinds, the commonest being thrush, leptothrix and *Oïdium albicans;* (8) prolapse of the uterus, causing ulceration of the vaginal mucosa by exposure and friction; (9) rarely, in children, wandering thread-worms from rectum.

Symptoms.—(1) *Leukorrhea* is the most constant symptom, varying from a thin serous discharge to a thick creamy purulent and very profuse flow. (2) *Pruritus*, probably chemical in origin, from the irritation of the discharge. (3) Moderate burning *pain* (in the acute cases only) referred deep into the pelvis. Certain varieties show special symptoms. In *acute granular vaginitis* the vaginal mucosa appears to have been dusted with large granules of red pepper and the discharge is profuse and creamy. This is almost certainly gonorrheal. In *senile vaginitis*, the mucosa is mottled, areas of redness contrasting with normal mucosa, and often, in the upper third, there are adhesions of the opposing surfaces.

Puerperal vaginitis is usually streptococcic, and produces a thick, greenish yellow false membrane. *Diphtheritic* false membrane is dirty gray. *Fungi* usually grow in white patches, easily wiped off, and leaving a bleeding surface behind. The thick leathery mucosa and wide patches of ulceration seen in *prolapse* are unmistakable.

Diagnosis.—The best view of the entire vaginal canal is given by the wire Ferguson bivalve speculum. The blades

do not cover the vaginal walls, and it is the best instrument for both diagnosis and for making local applications. Smears for microscopical examination can be taken from any portion of the canal.

Treatment varies with the kind of inflammation. Acute gonorrheal vaginitis requires: (1) Rest in bed; (2) milk diet; (3) large amounts of water (12 to 15 glasses daily); (4) twice daily a thorough vaginal douche with a hot 1–2000 permanganate of potassium solution (4 quarts during a period of 15 minutes) followed by 2 quarts of hot sterile water; (5) through a skeleton speculum, the entire vagina is painted, with pledgets of cotton on an applicator, with 25 per cent. argyrol or 1 per cent. nitrate of silver solution; (6) a tampon soaked with 50 per cent. ichthyol in glycerin or 25 per cent. boroglycerid is inserted, to remain until the next treatment. (7) If the vaginal mucosa is not markedly sensitive, douches of acetate of lead 2 per cent., or pyroligneous acid, 4 drams to the quart are of value. (8) Between treatments, the patient wears a sterile vulvar pad, thickly dusted with boric acid.

If the vaginitis has persisted for a considerable time or if the above-described treatment does not subdue the infection in ten or fourteen days, the vagina is bathed in a 40 grains to the ounce (8 per cent.) solution of silver nitrate, poured in through a bivalve or cylindrical speculum, and the instrument slowly withdrawn, to smooth out the folds of the mucosa. This is followed by a douche of normal salt solution, to convert the nitrate of silver into the insoluble chlorid. The application is repeated every other day. If two or three such applications do not effect a cure, the vagina is wiped out, through a skeleton bivalve speculum, with equal parts of glycerin and carbolic acid, followed immediately by a douche of 50 per cent. alcohol. The buttocks and labia should be thickly coated with vaselin before carbolic acid is applied.

Chronic vaginitis yields best to astringent douches, such as the following:

Acid carbolic	2 drams
Acid boric	1 ounce
Zinc sulphat	1 ounce
Alum. exsiccat	3 ounces

M. Sig. 2 teaspoonfuls to 2 quarts of hot water, twice daily. Dissolve the powder before adding it to the douche water.

A course of vaginal tampons of 50 per cent. ichthyol or 25 per cent. boroglycerid, as described in the section on office treatment, with the above douche in the intervals is the most satisfactory treatment.

Senile vaginitis is best treated by (1) suppositories of glycerin with thymol (5 per cent.) or eucalyptol (gr. 5) or iodoform (gr. 5) inserted at bedtime and followed in the morning by a douche of boric acid (two ounces to the quart). If this does not give prompt relief, paint the entire vaginal mucosa, through a skeleton speculum with 7 per cent. tincture of iodin.

Emphysematous colpitis responds to puncture of the vesicles, which do not refill, and boric acid douches, twice daily. All forms of *mycotic colpitis* (thrush, etc.) respond promptly to boric acid douches, after the mycotic patches have been wiped off with gauze.

In any case, the entire genital tract should be searched for any cause (endometritis, abscess of Skene's or Bartholin's glands, endocervicitis) which might be the primary source of the irritant which keeps alive the vaginal inflammation.

Prognosis.—In all cases except the gonorrheal, the prognosis is good. Gonorrheal cases are often most obstinate and recur after apparent cure, due to latent infection in Skene's or Bartholin's glands, the cervix or endometrium. In these cases, Skene's glands must be obliterated, Bartholin's dissected out, the uterine cavity disinfected, after dilatation of the cervix, by iodin and carbolic acid, equal parts, and often the cervix must be amputated, before even a relative cure can be obtained.

14. **Varices of the vagina** are rarely seen except in pregnancy and may then reach large size, with considerable danger of serious bleeding.

CHAPTER VI

ABNORMALITIES OF THE CERVIX, EXCLUDING TEARS

Normal Anatomy and Relations.—The cervix or neck of the uterus is that portion extending from the internal os (or lower border of the lower uterine segment) to the external os. The vaginal portion (about ⅓ of the total length) projects like a nipple into the vagina. The lips of the cervix, anterior and posterior, are separated by the external os. The supravaginal (and longer) portion of the cervix extends from the point of

a *b* *c*

FIG. 28.—*a*, Nulliparous cervix, with circular os uteri; *b*, nulliparous cervix, with transverse os; *c*, multiparous cervix, without laceration.

attachment of the vaginal mucosa to the internal os. Anterior to this portion is the bladder and vesico-uterine pouch of peritoneum; posteriorly lies the rectum and Douglas' pouch. The ureters lie close to this portion of the cervix; nearer the anterior half. The left ureter is much closer than the right, and the more the cervix is prolapsed or pulled down, the nearer are the ureters to it. This is a point to be remembered in vaginal hysterectomy.

The shape of the cervix in a nullipara is *conical;* in a multipara, *cylindrical.*

The external os in a nullipara is circular or more often oval; in a multipara (whose cervix is not torn) it is a transverse slit. In both, the canal is normally closed by a plug of thick tenacious clear mucus—the *corpus mucosum*. The shape of the cervical canal is spindle—narrowest portions at either os, and the broadest in the middle.

The *mucosa* of the *vaginal portion* is squamous epithelium and is normally pale pink. The mucosa of the cervical canal is grayish red, soft, cylindrical epithelium, with long slender ciliated cells with the nuclei at their bases. There is no submucosa. On the anterior and posterior walls of the cervical canal, the mucosa shows transverse folds, like the ribs of a leaf—the *arbor vitæ* or *palmæ plicatæ*.

The glands of the cervix are tubular, usually much convoluted, and extend deeply into the muscle.

Methods of Examination of the Cervix.—1. *Digital examination*, misleading in its results, and never solely to be depended upon.

2. *Sims' speculum* in either the dorsal or Sims' (left lateral) position, requiring a retractor to elevate the anterior vaginal wall as well.

3. *Bivalve speculum* (duck-bill) used in the manner described in the chapter on routine office treatment (Chapter II). This is much the best plan.

ABNORMALITIES OF THE CERVIX

Atresia of the Cervix

Atresia of the cervix is (1) congenital or (2) acquired. **Congenital atresia** is discovered only after puberty, when the menstrual blood is retained.

Symptoms.—(1) Severe menstrual molimina, without flow; (2) increasing pain; (3) a spherical cystic tumor in the pelvis; (4) specular examination demonstrates the closure of the canal.

Acquired atresia results from: (1) Ulceration of the cervix

—from injury, sepsis, malignant growths or the application of strong caustics in the canal; (2) cicatrization following repair or amputation of the cervix.

Symptoms are about the same as in the congenital variety, except that in the former the menstrual flow has never appeared. The treatment of both is given in detail under the heading of gynatresia in Chapter III.

Atrophy or Subinvolution

Atrophy or superinvolution is a part of the same process in the uterus, and any symptoms proceed from the latter. The cervix is exceedingly small, and presents in miniature the features of a normal cervix. The treatment is that of superinvolution of the uterus (*q. v.*)

Cancer of the Cervix (Cervical Carcinoma)

Frequency.—The uterus is the commonest site of cancer in the human body. Cancer is four times as frequent in the cervix as in the body of the uterus.

Age of Occurrence.—Most commonly between the ages of forty and fifty. About one-third of the cases are between thirty and forty. It is occasionally seen prior to thirty and after sixty, but these are rare. It has been reported at eighteen, and as late as eighty-two years of age.

Cause.—Nearly all patients with cancer of the cervix have had children (98 per cent.) and the vast majority have had several—five being the average. Therefore inflammation or traumatic lesions of the cervix, due to childbirth, are very constant etiologic factors. Neglected laceration of the cervix, with eversion and particularly erosion, is the most frequent cause. Cancer in a nullipara may start in an erosion, or in some injury to the cervix, as after forcible dilatation. The actual exciting cause in not known. Heredity does not play an important part. Many theories have been advanced but none proven.

Classification.—Cancer of the cervix is classified under two heads: the *clinical* and the *pathological.*

The *clinical* varieties are: (1) *Cauliflower*—the only *squamous-cell* variety—and much the commonest type. It originates from the squamous epithelium of the vaginal portion; (2) *ulcerative*—originating in the cylindrical epithelium of the cervical canal, and is *adenocarcinoma;* (3) *interstitial* or

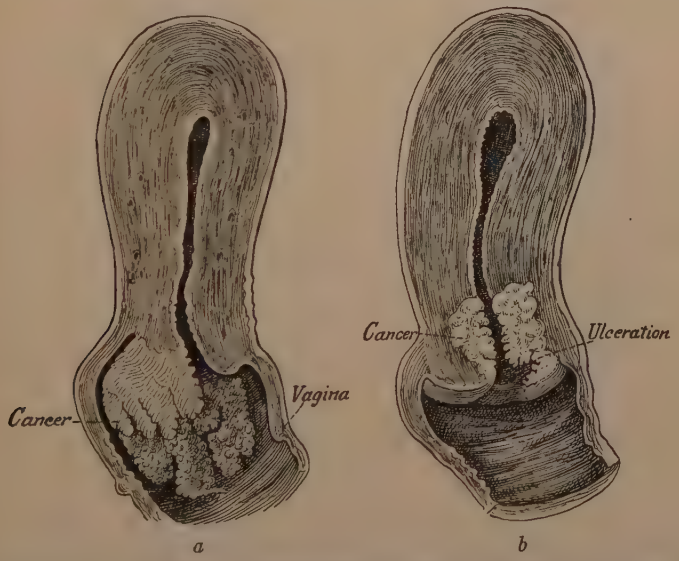

FIG. 29.—*a*, Cauliflower squamous-celled cancer of the cervix; *b*, ulcerative adenocarcinoma of the cervical canal. (*After Graves.*)

indurating—originating in the deeper portions of the cervical glands, and only secondarily ulcerative—in its later stages. Of the clinical varieties the cauliflower bleeds the most, the interstitial the least; and the interstitial is the most insidious and most likely to be overlooked.

The *pathological* varieties are: (1) *Squamous epithelioma,* with epithelial pearls (the cauliflower type); (2) *adenocarcinoma*—with hyperplasia of the lining epithelium of the glands, perforation of the basement membrane and infiltration

of the myometrium (the ulcerative and interstitial types); (3) *malignant adenoma*—malignant hyperplasia of the glands themselves without hyperplasia of the lining (more rarely in the ulcerative and interstitial types); (4) *malignant endothelioma*—a rare growth from the endothelium of the lymph spaces and vessels.

FIG. 30.

FIG. 31.

FIG. 30.—Inverting cancer of the cervix. In this case the growth is invading the walls of the cervix with little tendency to extend outward into the vagina. In this type there is an earlier invasion of the parametrium. It can be seen from the drawing that the disease might escape detection by the examining finger. This form of the disease is especially treacherous, as it is liable to be overlooked. (*After Graves.*)

FIG. 31.—Extensive crater formed by carcinoma of the cervix, with infiltration of the vagina. (*After Graves.*)

Direction of Metastasis.—Lymphatic metastasis takes place into the deep sacral, lumbar and finally the renal glands. Cancer of the cervix also spreads by direct continuity to the bladder, rectum and vaginal vaults. It almost never gives metastasis to the groin, and rarely to distant organs. Vesico-vaginal and recto-vaginal fistulæ are common complications of the later stages.

How Cancer Kills.—(1) Cachexia, secondary anemia and exhaustion; (2) hemorrhage; (3) intestinal obstruction; (4) septic pyelitis; (5) general septicemia; (6) rarely from distant metastases; (7) pulmonary embolism from the accompanying thrombophlebitis. The usual duration from the appearance of the first symptoms is one to three years.

Clinical History and Symptoms.—There are three cardinal symptoms of cancer of the cervix:

Bleeding.—This is irregular from the start, due to capillary erosion, and occurs either near the time of the menopause or after the menopause has been established. It may be a blood-stained watery discharge, but is usually frank bleeding. *Irregular bleeding in any patient past* 35 *is a symptom that demands immediate and thorough investigation.* Ignorance or neglect of this dictum is why over 60 per cent. of cases first present themselves for treatment after the cancer is inoperable.

2. *Foul Discharge.*—This occurs relatively early in the cauliflower growth, later in the ulcerative and latest in the interstitial. It is due to necrosis and sloughing. Periodic gushes of pus are due to obstruction of the cervix and pyometra. The discharge is very foul, and is most profuse in cauliflower growths. In the others, it is likely to be watery for a considerable time.

3. *Pain,* is a late symptom, and of no value in an early diagnosis. The cervix is relatively insensitive, and pain appears only when the growth has involved the vaginal vaults or the sacral plexus. The presence of pain, with rare exceptions, means that the case is inoperable.

Cachexia occurs very late, and never in cases that are operable. It is extreme, however, when it does occur. Fever is common, and due to infection and not the ulcerated mass per se.

Diagnosis is comparatively easy. All cases are operable in the early stage. Any patient who complains of irregular bleeding should be examined, in the dorsal position, and the cervix inspected through a bivalve speculum. A suspicious erosion

or induration, particularly if it bleeds to a slight touch, should have a piece removed by tenaculum and scissors, for microscopical examination. This is painless and the resulting bleeding slight and easily controlled by a tampon. If the source of the bleeding is not in the cervix an exploratory dilatation and curettage of the uterine cavity must be done, and the scrap-

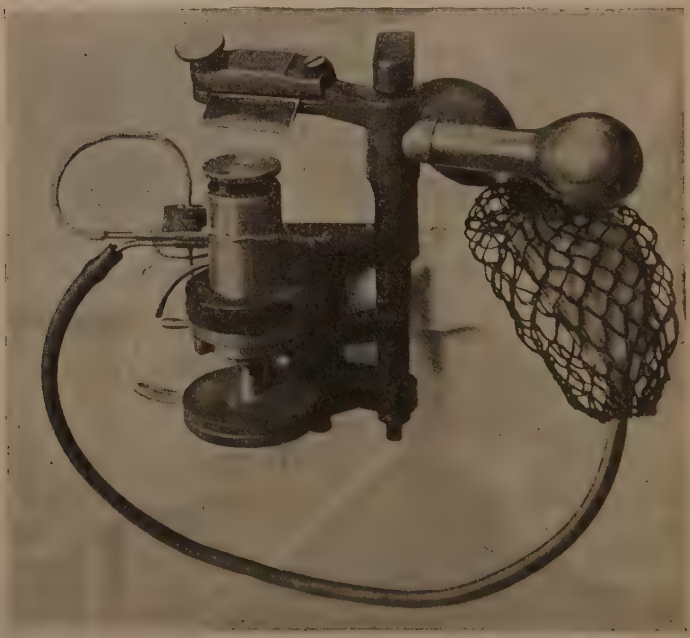

FIG. 32.—Jung-Hobel freezing microtome; ether spray.

ings examined microscopically. With these simple precautions, most if not all cases can be recognized early enough to give operative removal a brilliant chance of success. In the stage where the patient usually presents herself for treatment, recognition is easy. The cauliflower growth fills the vaginal vault with a friable, bleeding, sloughing mass, surrounded by an indurated ring of cervix. The ulcerative growth (adenocarcinoma) shows as a sloughing crater in the cervix, bleeding

easily to the touch. The interstitial, prior to the stage of ulceration, shows a stony, hard, hypertrophied cervix, usually fixed and immovable, and requires for diagnosis curettage of the cervical canal or removal of a piece of the cervix for microscopical diagnosis. In any case where doubt exists, the microscope will infallibly decide.

Simple erosion of the cervix bleeds easily, but is not indurated, is not friable, causes no destruction of tissue, has no foul discharge, and the microscope will show benign growth.

A normal polyp is not ulcerated and does not infiltrate. A *sloughing polyp* has no infiltration at its base, no deep ulceration, no infiltration of surrounding tissue, but is friable and can be broken up with the fingers.

Syphilis yields promptly to specific treatment.

Sarcoma is only distinguishable by microscopic examination.

Tuberculosis shows a punched out ulcer with undermined edges, pale granulation, little bleeding, and the microscope and inoculation experiments will settle all doubts.

In cases where time is an object, the freezing microtome will give a diagnosis in a few minutes. In all cases, it is wiser to take, if possible, the slower but more accurate paraffin or celloidin method.

A case is operable: *i.e.*, suitable for hysterectomy, (1) When the uterus is movable; (2) when there is no invasion of the broad ligaments; (3) when there is no involvement of the vaginal vaults, bladder or rectum. Conversely when the uterus is fixed, the broad ligaments infiltrated, the vaginal vaults indurated and extension to the bladder and rectum walls, any attempt at radical operation is hopeless.

The interstitial variety reaches the inoperable stage earliest, and only about one-third of the cases presenting themselves for treatment permit of radical operation. The presence of enlarged lymph-glands does not mean that these glands are cancerous, and if they are, it does not mean the case is hopeless, though the prognosis is unquestionably worse.

These glands can be extirpated with the uterus, and permanent cure result.

Methods of radical operation are of three types. (1) Abdominal pan-hysterectomy—preferably by the technic of Wertheim. (2) Vaginal panhysterectomy. (3) Combined vaginal and abdominal panhysterectomy, where the uterus is freed from its lower attachments through the vagina, and is removed through the abdomen.

Abdominal panhysterectomy is preferable as a routine procedure.

Vaginal hysterectomy has certain advantages: (1) Rapidity of operation; (2) absence of shock; (3) in fat women; (4) a lower primary mortality. Its disadvantages are: (1) Lack of room; (2) danger of clamping of ureters; (3) danger of injury to bladder and rectum in advanced cases; (4) difficulty in dealing with adhesions; (5) a lower percentage of five-year cures; (6) danger of secondary hemorrhage.

The ideal case for vaginal hysterectomy is the patient who is very fat, who could not stand the Trendelenburg position demanded by the abdominal route; who has a movable uterus, with no direct metastases, with relaxed pelvic floor. All advanced cases are best done by the abdominal route.

Technic. (1) *Wértheim Abdominal Panhysterectomy.*—(1) The patient is prepared as for any pelvic operation and anesthetized.

2. She is arranged in the dorsal position and the vagina cleansed.

3. Any sloughing mass is removed, and its base thoroughly seared with the cautery.

4. The vagina is painted with 5 per cent. tincture of iodin and packed with sterile gauze.

5. The patient is placed in the extreme Trendelenburg position and the abdomen opened in the middle line, the lower end of the incision being on the symphysis; a self-retaining abdominal retractor is put in place and all intestines packed out of the pelvis.

6. The uterus is caught by a Somers clamp and held forward.

7. The ovarian arteries and round ligaments are ligated on both sides, and a clamp placed above the ligatures to control reflex bleeding.

8. The broad ligaments and peritoneum are split anteriorly from one side of the pelvis to the other, above the attachment of the bladder.

9. The bladder is freed anteriorly, and both broad ligaments dissected down until the ureters are exposed.

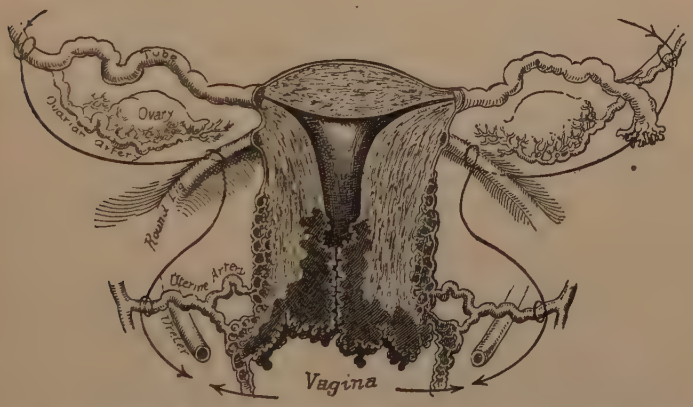

FIG. 33.—Diagram illustrating the tissue to be removed in the radical operation for cancer of the cervix. (*After Kelly.*)

10. The uterine arteries are caught outside the ureters, cut and ligated.

11. The peritoneum is separated posteriorly and both utero-sacral ligaments caught and tied.

12. The uterus is pulled strongly upward, and a clamp placed on each side so as to include the angle of the vagina.

13. The vagina is cut across and the uterus removed.

14. The vagina is immediately closed, with number 3 chromic catgut.

15. Two ligatures are placed under the clamps securing the angles of the vaginal wound and tied outside the clamps. This

secures, with one stitch, the troublesome uterovaginal venous plexus.

16. Any obvious glands are removed. Extended search is not necessary.

17. The peritoneum is closed over the vaginal stump, with number 3 chromic catgut.

18. The packs are removed and the abdomen closed.

19. The vaginal packing is removed at the completion of the operation.

Technic of Vaginal Hysterectomy.—1. The patient is prepared as for any pelvic operation and anesthetized.

2. The cervix is sterilized with the cautery, and pulled down by a double tenaculum.

3. The cervix is freed from its vaginal attachments by a circular incision.

4. The bladder is pushed up anteriorly, with gauze, a retractor placed under it for protection, and the anterior pouch of the peritoneum caught and opened.

5. The uterus is caught with a volsellum and anteverted through this peritoneal opening.

6. The broad ligaments are caught in clamps, and cut through near the uterus. Three clamps to each side are needed.

7. A better, though more difficult plan, is to ligate the broad ligaments, with three ligatures, cutting free each section as it is tied, and holding the stumps with a hemostat.

8. When the broad ligaments are tied or clamped and cut, the peritoneum is opened posteriorly, and the uterus removed.

9. If ligatures have been used, the stumps of the broad ligaments are sewed together, the peritoneum and vaginal walls closed over them with number 3 chromic catgut. If clamps were used, the pelvis and vagina around the clamps is packed with gauze, and the handles of the clamps so supported by a suspensory bandage that the blades are not dragged upon. Clamps are cautiously removed, after seventy-two hours.

Technic of Combined Hysterectomy.—1. This is the same as the vaginal operation until the peritoneum is opened anteriorly. 2. From this point it is the same as the Wertheim.

Prognosis after operation depends greatly upon how advanced the disease was when the operation was done. The most optimistic reports give 30 per cent. as free from recurrence for five years. Ten per cent. would be a more accurate average. The primary mortality is from 6 per cent. to 10 per cent., the chief causes of death being peritonitis and secondary hemorrhage.

Palliative Treatment of Inoperable Cases.—This is applicable to cases so far advanced that complete removal is not possible.

Methods.—I. *Curet, Heat and Chemical Cautery.*

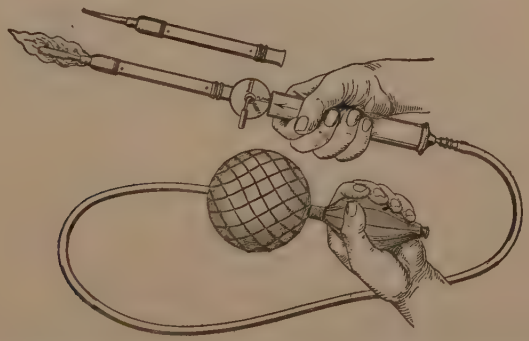

FIG. 34.—Paquelin's cautery. Note that the benzene is contained in the handle of the apparatus. (*Ashton.*)

Technic.—1. The patient is anesthetized, and placed in the dorsal position.

2. The crater of the cervix is exposed by a cylindrical wooden Ferguson or water-cooled cylindrical speculum. The ordinary metal ones get too hot during the cauterization.

3. The sloughing mass of cancer is curetted away by a curet with saw-tooth edges.

4. As soon as reasonably firm tissue is reached, the crater is thoroughly cooked with the electric dome or Paquelin button

cautery. The electric is much the better, and the point in either one should be a *dull* cherry red, to minimize bleeding.

5. The cavity is then packed with a tampon soaked in 50 per cent. zinc chlorid solution, or equal parts of adrenalin

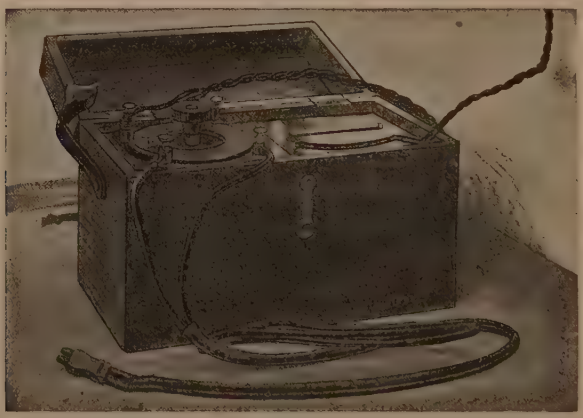

FIG. 35.—Transformer for electrocautery. This is a rheostat and motor, as required for the direct current. An alternating current requires the rheostat only, which is a much less expensive apparatus. The cable shown can be boiled, but the insulation rots quickly. It is equally good to cover the cable with sterile towel. (*B. C. Hirst.*)

1–1000 and 40 per cent. formaldehyd solution (the stock solution).

6. The wet tampon is held in place by other tampons thickly smeared with an ointment of 30 per cent. sodium bicarbonate in vaselin, to prevent vaginal eschars.

FIG. 36.—Electrocautery point. The dome-shaped spiral is kept at a constant dull red heat. (*B. C. Hirst.*)

7. The tampons are taken out in eight days, the patient kept in bed for ten. Hypodermics of morphin are used, in ascending doses, to control pain.

II. *The Percy low-heat method* is based upon the theory that cancer cells cannot withstand a temperature of 45°C. for ten minutes, while the normal cell will withstand 60°C. The cervix is exposed through a water-cooled cylindrical speculum, the electric cautery point is pushed into the mass and the current turned on. An assistant, through a small abdominal incision, holds the fundus uteri in his hand, and when the uterine body becomes uncomfortably hot to his gloved hand, the direction of the cautery point is changed. Frequently, preliminary ligation of the internal iliacs is done, when hemorrhage is feared. By this method the gross malignant mass is often removed at one sitting, though usually several are required. It is not free from danger, hemorrhage, fistulæ and deep-seated abscess being frequent complications.

III. *Byrne Method*—the oldest of the cautery methods. By means of the cautery knife and button cautery the uterus is slowly burned out, so that a mere shell is left. The degree of heat is a dull cherry red, and the knife or button are always placed in contact with the tissue to be cut, before the current is turned on. This is to minimize bleeding. The results have been excellent.

IV. *X-ray* in the treatment of cancer of the cervix has been a disappointment.

V. *Radium* is of great value, particularly in the recurrences after operation. It is applied for three or four hours to five days at a time, being either implanted in the cervix, or held in place by a tampon. One hundred milligrams are used and two or three weeks rest between treatments is given. The gamma rays penetrate three to four centimeters.

The therapeutic value of radium depends on: (1) The amount used; (2) the nature of the filter (brass being the best); (3) the method of application; (4) the length of exposure; (5) the frequency of treatment.

The results are often brilliant, sometimes utterly disappointing, but occasionally radium will transform an inoperable into an operable case. No operation should be undertaken until

three weeks from the last radium treatment, because of the danger of sepsis.

VI. *Mesothorium* is used as radium, but the supply is very limited and it is no more effectual than radium.

Length of life after palliative treatment varies with the extent of the disease when seen. After curetment and cauterization, the patient usually markedly improves, the discharge and bleeding cease, and for a time she will even gain in weight. Life is prolonged for eighteen months to five years, and, rarely, repeated cauterization has resulted in a symptomatic cure.

After-treatment of palliated cases consists in: (1) Frequent vaginal douches (two daily) of lysol solution one dram to two pints or formalin 1 per cent.; (2) full diet; (3) laxatives to secure daily movements; (4) local applications of acetone to the cervical crater, when the bleeding and discharge return; (5) morphin in sufficient doses to control the pain. This will be needed first at night, and later at frequent intervals, night and day; (6) the patient had better not be told she has cancer, on account of the mental depression.

Recurrence after removal of the uterus takes place any time from a few weeks to five or more years. The vast majority occur in the first six months, and after five years recurrence is very rare. The first symptom is slight irregular bleeding. Vaginal examination shows a hard nodule in the scar in the vaginal vault, with a small granulating area, and bleeding easily to the touch. The extent of involvement is best made out by rectal examination. Pain is of a burning character and is usually very severe.

Treatment is *radium*, either with or preferably without a preliminary superficial cauterization. No other treatment offers any hope, but radium will often cause the prompt disappearance of surprisingly large recurrences. The patient must be closely watched, however, as re-recurrence is very possible, and is treated in the same way.

Cervicitis and Endocervicitis (Chronic Cervical Catarrh)

Cervicitis and *endocervicitis*, except where caused by laceration in childbirth, are due to specific or non-specific infection.

Pathology.—The glands are dilated, the lining epithelium in places absent. The stroma is edematous and infiltrated with round cells.

Symptoms.—Leukorrheal discharge, of thick, stringy, mucopus, profuse enough to require a napkin for protection, is the only symptom. Through a bivalve speculum, erosion of the vaginal portion of the cervix, especially on the posterior lip, and the discharge issuing from the canal can be seen.

Treatment.—(1) Repeated vaginal douches (two a day) of zinc sulphate and alum; (2) tampons of boroglycerid 25 per cent. or ichthyol 50 per cent.; (3) local application, through a bivalve speculum, of 7 per cent. tincture of iodin or, better, nitrate of silver 8 per cent. (40 grains to the ounce); (4) instillation, every other day, into the cervical canal of 50 per cent. ichthyol, 50 per cent. argyrol or 5 per cent. silvol paste. Instillations are best in the form of a slowly melting paste, rather than solutions, as the paste is retained long enough to penetrate into the glands. The technic is described in Chapter II; (5) in obstinate cases, amputation of the cervix, or Schröder's operation of removal of the cervical mucosa, by wedge-shaped excision of each lip. The condition is often very stubborn, and will persist for years.

Ectropion of the Cervix (Eversion)

This is the result of bilateral laceration, the lips of the cervix diverging like a split stalk of celery. The lips are asymmetrical, the anterior being usually the longer. The deep red mucosa of the cervical canal is exposed. If the tear is stellate, there is often considerable hypertrophy of the cervix.

Symptoms.—Leukorrheal discharge. The diagnosis is made through a bivalve speculum.

Treatment.—Repair of the injury, or, of the cervix is hypertrophied, amputation of the cervix. For details of technic see Chapter XII.

Erosion of the Cervix

This is a prolapse of the deep red columnar epithelium of the cervical mucosa over the squamous epithelium of the vaginal portion of the cervix. It is *not* ulceration, though it has that appearance. It is most often caused by laceration of the cervix, though it may be the result of any irritation. It is not infrequently seen in virgins, supposedly due to malposition of the cervix with retroflexion or anteflexion of the uterus, so that there is undue friction between the cervix and the vaginal walls. Erosion is common in gonorrhea and in non-specific infection of the cervix.

Fig. 37.—Bilateral laceration of the cervix, with marked eversion, as seen through a bivalve speculum. (*After B. C. Hirst.*)

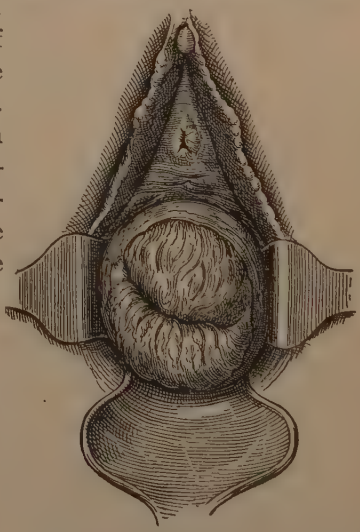

Fig. 38.—Erosion and eversion of the cervix, secondary to bilateral laceration. (*After Crossen.*)

Symptoms.—Leukorrheal discharge, often blood-stained, because the cylindrical epithelium bleeds at the slightest touch. The diagnosis is made through a bivalve speculum, which shows plainly the red, angry area of hyperplastic cervical mucosa.

Digital examination alone is unsatisfactory; the erosion is not easily felt, and its extent cannot be ascertained.

Treatment.—(1) If due to laceration, repair or amputation of the cervix, the latter if it is hypertrophied, is required. No form of local application will cure permanently an erosion due to laceration; (2) if due to non-gonorrheal endometritis, dilatation and curettage of the uterus. In gonorrhea, this is to be avoided, as it will very probably be followed by pus tubes; (3) nitrate of silver (8 per cent.; 40 grains to the ounce) applied through a bivalve speculum three times a week; (4) tampons of boroglycerid 25 per cent. or ichthyol 50 per cent.—three times weekly; (5) daily vaginal douche of zinc sulphate and alum solution (see Chapter II); (6) instillations into the cervix of 5 per cent. silvol paste, three times weekly; (7) in the erosion of virgins, instillation or amputation of the cervix. Any erosion is a possible site of cancer, hence intractable ones should be excised and examined microscopically.

Hypertrophy of the Cervix

This is nearly always the result of laceration and consequent hyperplasia of the cervical connective-tissue stroma. The complicated racemose glands easily become obstructed and cystic, and often show on the vaginal portion, as small pearly cysts, the Nabothian follicles.

Hypertrophic elongation of the cervix is a consequence of prolapse of the uterus, due to the pull of the vaginal walls.

Diagnosis is made by palpation, inspection through a bivalve speculum, or by simple inspection, if the case is one of prolapse.

Treatment is amputation of the cervix.

Cervical Myoma

Cervical myoma is primarily very rare. Most cervical myomata are polypoid, and have originated in the lower uterine segment and grow downward. True cervical myoma grows as any other fibroid, causes pressure symptoms on the

bladder and rectum comparatively early. The diagnosis is made by bi-manual examination. Because of their bulk, a satisfactory specular examination is difficult or impossible. The treatment is removal through the vagina, usually by morcellation, and is attended with considerable risk of injury to the bladder and rectum.

Nabothian Follicles

When as a result of chronic irritation, the cervical glands are obstructed and cystic, they often show upon the vaginal portion of both lips as small pearly cysts. These are the Nabothian follicles, but the glands from which they come are *not* Nabothian glands.

The follicles contain cervical mucus, as a rule clear, but sometimes purulent from secondary infection. They may be felt by digital examination, but a bivalve speculum shows them plainly.

If punctured, they usually refill, and the only satisfactory cure is trachelorrhaphy or amputation of the cervix.

Cervical Polyps

Cervical polyps are very common. They are seen most frequently after forty years of age, though no age is exempt. They are a very common cause of bleeding after the menopause.

Kinds.—1. *Mucous Polyps*—the commonest—represents a hypertrophy of the endocervical mucosa. They are often multiple, rarely of large size, are bright red or purplish in color, grow from any portion of the cervical canal and are most often pedunculated.

2. *Fibroid or fibro-adenomatous polyps* are larger, may attain the size of a child's head, and either project from the cervix or are contained in a cavity representing the dilated cervical canal, like a ball in a socket. They are usually single. They are bright red in color, and very firm to the touch—a marked contrast to the soft mushy mucous polyp. They might easily be mistaken for the ovum in inevitable abortion, retained within the cervical canal, but are much more solid in feel.

Attachments.—(1) *Pedunculated*—much the commonest, the pedicle being relatively slender, especially in the mucous type. (2) *Sessile*, where the attachment is broad and firm.

Symptoms.—(1) *Bleeding*—irregular and often very profuse. (2) *Leukorrhea*—varying from the thin serous discharge of the fibroid polyps to the profuse mucopurulent type seen in infected mucous polyps. (3) *Pain* is not present, except in globular fibroid polyps in the cervical canal, when it is expulsive, like that of miscarriage, but less intense.

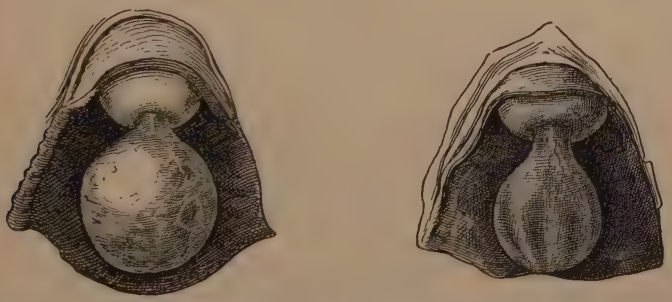

FIG. 39.—Fibro-adenomatous polyps, hanging from the cervical canal. (*After B. C. Hirst.*)

Diagnosis.—(1) Digital examination. The mucous polyp is soft, the fibroid hard and firm. (2) Bivalve speculum shows the growth protruding through the os or visible in the dilated canal.

Before any attempt is made to remove a large fibroid polyp, inversion of the uterus must be excluded.

Degenerations.—(1)Infection, (2) cystic, (3) gangrene, (4) malignant (carcinoma in the mucous, sarcoma in the fibroid.

Treatment.—No polyp is innocent, and all must be removed. The method of removal depends upon the attachment. Mucous polyps are pedunculated, fibroid polyps may be grasped with a forceps and cut off, snared off or best twisted off. Bleeding is not to be feared. Sessile polyps require splitting of the cervix anteriorly, incision of the capsule at the base of the

growth, when the polyp may be seized with a volsellum and enucleated with the fingers. No ligatures are required, as the blood supply is poor. A very broad base will require two or three transverse catgut sutures to close it, and the incision in the anterior lip of the cervix is closed after the tumor is removed.

In *every* case, the removal of the polyp should be followed by a dilatation and curettage, and both the polyp and scrapings should always be examined microscopically for malignancy. A polyp of any kind is best removed under anesthesia and in proper hospital surroundings and not as an office procedure. Dangerous infection may follow neglect of this precaution.

Sarcoma of the Cervix

Sarcoma is exceedingly rare, except as sarcomatous degeneration of a fibroid polyp. Primary sarcoma occurs as a hydatidiform growth, of a purple color, extended from the cervix. The symptoms and treatment are those of cancer of the cervix. Radium is said to be more active and efficient in sarcoma than in cancer, but this is very doubtful.

The prognosis is bad. All the reported cases have died.

Tuberculosis of the Cervix

Tuberculosis is rare, much less common than in the body of the uterus. The infection is primary and appears as an irregular punched out ulcer, with ragged undermined edge and pale granulations. The accurate diagnosis is made by excision and microscopic examination.

Treatment.—If there is widespread tuberculosis elsewhere, palliative treatment (local cauterization) alone is required. If there is no evidence of general tuberculosis, amputation of the cervix, or panhysterectomy.

Ulceration of the Cervix

Ulceration of the cervix is a much abused term. Usually it is synonymous with erosion, which is not a true ulcer. True

ulceration, with actual loss of substance, is seen in prolapse of the uterus, chancre, chancroids, cancer and tuberculosis.

The ulcers of prolapse are treated by reposition of the uterus, rest in bed, and boroglycerid tampons.

Chancre heals promptly under neosalvarsan.

Chancroids require cauterization with the cautery, carbolic acid or fuming nitric acid.

Cancer and tuberculosis both require panhysterectomy.

CHAPTER VII

THE UTERUS—ITS NORMAL POSITION AND RELATIONS, ITS ABNORMALITIES OF POSITION AND DISEASES

At birth, the uterus lies high in the pelvis, its axis is straight, and it is normally pressed backward. During childhood it gradually sinks deeper in the pelvis. The normal angulation

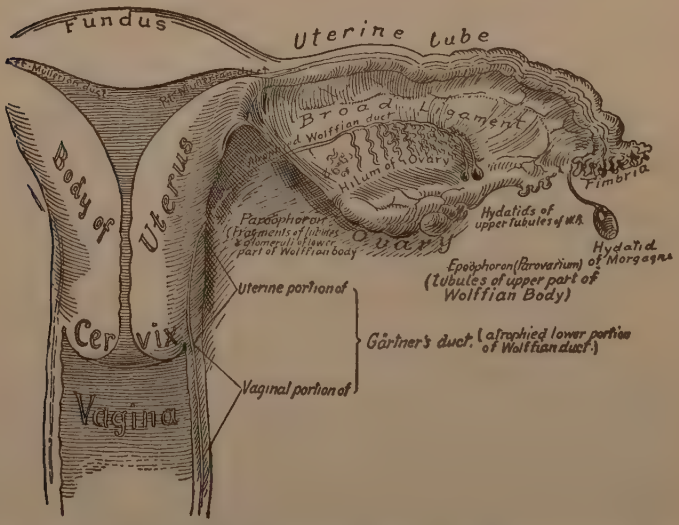

FIG. 40.—Diagram of the uterus and vagina, and the structures of the broad ligament. (*Kelly after Cullen.*)

between the body and the cervix does not appear until near puberty. The uterus grows in size for some years after puberty. Childbearing increases its size in all dimensions by about 1 cm. and its weight about 25 grams.

The virgin uterus is normally 7 to 8 cm. long and weighs 50 grams. The natural position in the adult, in the standing posi-

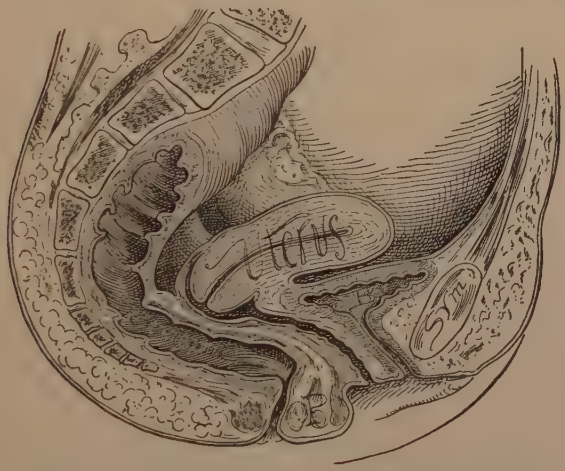

FIG. 41.—Normal position of the uterus. (*Ashton.*)

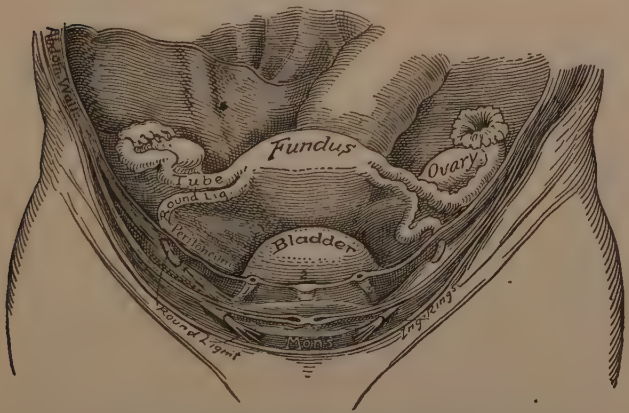

FIG. 42.—Normal position of the uterus, seen from above.

tion, is horizontal, its axis meeting the vaginal axis at an angle of 90 degrees. The anterior wall lies on the back wall and fundus of the bladder; on the posterior wall rest the intestines.

It can change its position through wide limits; it may be rotated backward through an angle of 180 degrees; laterally through one of 45 degrees, to each side; it moves backward and forward with every breath, is pushed far back when the bladder is full; and on straining, it is pushed to a lower level in the pelvis.

How Retained in Position.—By (1) the support of the perineum, (2) intra-abdominal pressure, exerted on the posterior wall, keeping it normally anteverted; (3) the uterine ligaments, which are partly suspensory and partly guy-ropes.

Ligaments of the uterus are ten in number—five pairs. (1) Two *broad* ligaments—the folds of peritoneum at either side; (2) two *round*—from each cornu to the internal inguinal rings and thence down the inguinal canal to the pubic spine; (3) two *uterosacral;* (4) two *uterovesical*, though commonly fused so as to appear one; (5) two *cardinal*—bands of connective tissue in the parametrium in the bases of the broad ligaments, running from about the level of the internal os, through the bases of the broad ligaments to fuse with the fascia on the lateral pelvic wall.

Peritoneal coat of the uterus (perimetrium) covers the posterior wall, above the level of the internal os; the fundus; the anterior wall as far as the attachments of the bladder. It is tightly adherent everywhere except on the anterior and posterior surfaces of the lower uterine segment.

The **parametrium** is the connective tissue in the base of the broad ligaments and under the anterior and posterior peritoneal reduplications—in Douglas' pouch and behind the bladder.

The **myometrium** is the uterine muscle—arranged in three layers and unstriped.

The **endometrium** is the mucous membrane layer lining the cavity. It has no submucosa. It is 1–2 mm. thick, composed of a spindle-celled connective tissue strewn with many tubular glands, lined by ciliated columnar epithelium. The epithelium of the body differs from that of the cervix.

The cervical cells are long, thin, with nuclei at the bottom. The corporal cells are short, fat, with nuclei in the center. The cilia lash toward the os uteri.

The **uterus during lactation** is much smaller than normal, a temporary condition due to shrinking of the muscle fibers. Any curetment done after miscarriage or during lactation, causes an extra risk of perforation of the uterus.

When lactation ceases, the uterus returns to its normal size.

The **uterus after the menopause** is permanently atrophied, its axis is straight, and its mucosa atrophied.

ABNORMALITIES AND DISEASES OF THE UTERUS

Anterior Displacement: Anteflexion, Anteversion, Anteposition

Anteflexion of the Uterus

Anteflexion of the uterus is an increase in the normal angulation between the cervix and corpus uteri. It is often associated with ill-development of the uterus and stenosis of the cervical canal. It is essentially a condition of nulliparæ only.

Causes.—Unless it is caused by the pull of adhesions or a tumor behind the uterus (both of which are rare) the condition is congenital, due to faulty development.

Symptoms.—(1) *Dysmenorrhea*, the pain being most severe for the first twenty-four hours of the period, and gradually subsiding as the flow is established; (2) a brown leukorrhea, at the end of the period, due to slow draining of retained blood; (3) sterility; (4) in many cases, pronounced neurotic symptoms.

Diagnosis.—If the examining finger is passed along the anterior wall of the cervix, and pressed deeply into the anterior vaginal vault, the sharp U-shaped bend can be felt; bimanual examination reveals the anterior position of the uterus; specular examination shows a long conical cervix and a pinhole os uteri.

Treatment.—The most satisfactory treatment is forcible dilatation of the cervical canal, thus straightening out the axis, followed by Schatz's metranoikter, left in place for 24 hours.

Technic.—(1) The patient is prepared as for any vaginal operation, arranged in the dorsal position and anesthetized.

2. The anterior lip of the cervix is caught with a double tenaculum and held by an assistant.

FIG. 43.—Anteflexion of the uterus. A lateral view.

3. The cervical canal is dilated with a light Goodell dilator, just enough to admit the blades of the heavy Wathen dilator. In very tight stenosis, the internal os must be first penetrated with a probe and then a uterine sound before the light dilator can be inserted.

4. With a heavy Wathen dilator the cervix is dilated to one inch transverse measurement, making pressure by the side screw of the instrument and *never* by pressing the handles together, nor should the instrument be rotated from side to side. Ten minutes should be taken to reach the one inch mark, to avoid tearing.

5. With a four-bladed Cleveland dilator, a dilatation of 90 mm. circumference is now secured.

6. No curettage is desirable, unless the patient has leukorrhea. If done, it is performed gently, with a sharp Sims curet. Dull curets are useless here.

7. The uterus is washed out with sterile water.

8. The two-bladed Schatz metranoikter, or better its four-bladed B. C. Hirst modification, is inserted in the uterine canal, as far as it will go, and the vagina packed with gauze.

FIG. 44.—Replacing uterus in proper position after curettement. If this is neglected, permanent retroversion may result. (*After Crossen.*)

9. Twenty-four hours later, the metranoikter is removed, and the uterus washed out with sterile water, this lavage is most essential.

10. The patient is kept in bed for one week.

About half the patients require a dose of ¼ grain morphin sulphate hypodermically during the night following operation, due to pain from pressure of the metranoikter.

Alternate Methods of Treatment.—(1) The *Wylie drain* is often used in place of the metranoikter. It is a plug of aluminum or hard rubber, channeled to permit escape of discharge. It is inserted in the uterine canal at the point where by the above technic the Schatz instrument is used. It is not as efficient as the metranoikter, has some risk of infection of the endometrium and pyosalpinx, and fatal infection has followed its use. From all these objections, the metranoikter has proven itself free. One of these instruments must be used, however, to secure satisfactory permanent dilatation. The simple instrumental dilatation is not permanent.

(2) *Tents.*—Plugs of compressed sponge or tupelo wood, designed to absorb moisture after being inserted in the uterine canal, and by their swelling to dilate the cervix, have fallen into deserved disrepute. They cannot be satisfactorily sterilized.

(3) *Dudley's operation* is discission of the posterior cervical lip, through the internal os, and sewing the wound transversely, to cause gaping. It is efficient in relieving the stenosis, but is often followed by annoying leukorrhea from endocervicitis and erosion, and may require repair of the cervix or even amputation.

Palliative treatment, of a condition which is largely mechanical, is usually a waste of time, and often a real danger, due to the use of habit-forming drugs. For temporary use, the following will be found useful, but not over long periods.

(1) Rest in bed during the first two days of the period; (2) hot water bag to lower abdomen; (3) hot vaginal douches (115′–120′) three times daily (hot enemata in young single women); (4) tincture of gelsemium, ♏x four times daily; (5) acetanilid gr. 2, ammonium carbonate gr. 3 every three hours; (6) if stronger sedatives are needed, codein sulphate gr. ¼ hypodermically and *not morphin.*

Pessaries for anteflexion are practically useless. The intrauterine stem pessary of any form is dangerous because of infec-

tion; Schultz's sleigh, Thomas' anteversion and Hewitt's cradle pessaries are all of so little use as hardly to be worth a trial.

ANTEVERSION OF THE UTERUS

Anteversion of the uterus is its normal position, and the use of this term to describe a pathologic condition is erroneous.

ANTEPOSITION OF THE UTERUS

Anteposition of the uterus is the pushing forward of the organ by a tumor or abscess behind it, or is due to the pull of adhesions. The symptoms are dysuria and irritability of the bladder, due to pressure. When the cause is removed, the uterus resumes its normal position.

The irritability of the bladder in early pregnancy is due to pressure from anteposition of the uterus, because the increased weight of the body and greater flexibility of the lower uterine segment permit the uterus to fall forward on the bladder.

Lateral flexion of the uterus is due to (1) adhesions; (2) pressure of a growth; (3) congenital deformity (uterus unicornis).

BACKWARD DISPLACEMENT OF THE UTERUS: RETROFLEXION AND RETROVERSION

In retroversion, the uterus is turned back as a flail; in retroflexion, it is bent back at the lower uterine segment. Except for the position of the cervix, which in retroversion is often further anterior, the two conditions are practically identical in causes, symptoms and treatment, and will be so considered.

Causes.—(1) Congenital, where the uterus has developed in the posterior position; (2) relaxation of the uterine supports or musculature; (3) the drag of adhesions; (4) pushed back by a tumor.

By far the greatest number of cases follow childbirth, and hence belong under the second head.

Predisposing causes are: (1) Violent jars or falls, producing a traumatic displacement, which may be permanent if neglected; (2) long-continued overfilling of the bladder; (3) perineal lacerations; (4) subinvolution of the uterus after childbirth.

Time of occurrence is, in the cases following childbirth, most commonly between the third and sixth weeks of the puerperium.

Symptoms.—(1) Backache, low down over sacrum, and always central; (2) headache, most marked over the vertex or occiput; (3) pelvic pain, on one or both sides, due to congestion from torsion of the broad ligaments; (4) increased menstrual flow; (5) often dysmenorrhea; (6) nervous irritability; (7) leukorrhea. The backache and headache are usually relieved on lying down; all symptoms are more marked at the menstrual periods. None of the symptoms are constant, and many women with retroversion exhibit no symptoms whatever.

Diagnosis is made by bimanual examination, with the patient in the dorsal position, preferably on a table. It is absolutely essential that the bladder be empty; a full bladder temporarily pushes the uterus backward and may cause a mistaken diagnosis.

1. With the patient in the dorsal position, two fingers of one hand are placed in the vagina, with the finger tips in front of the cervix; (2) with the free hand, pressure is made on the abdomen, in the middle line, just above the symphysis; (3) if the uterine body is in good position, it can be felt between the fingers. If not, the fingertips, provided the patient is not fat and does not resist, will meet with only the tissues of the abdominal wall and vaginal vault between them; (4) the fingers of the vaginal hand are then moved behind the cervix, and the body of the uterus can be felt posteriorly. The use of a sound for diagnosis of position is unnecessary and dangerous.

Degrees of Retroversion.—First degree—with the fundus tilted away from the bladder; *second degree*, with the fundus

pointing about to the middle of the sacrum; *third degree*, with the fundus completely back in Douglas' pouch.

Differential Diagnosis.—The commonest error is to mistake an anteflexed uterus, with retrocession, for a retroversion. The sharp anterior angle of flexion can always be felt; (2) myoma; (3) ovarian cyst; (4) dense pyosalpinx adherent in Douglas' pouch.

Rectal examination is often required in (1) young girls, (2) when patient resists vaginal examination. The cervix feels considerably larger by a rectal than by vaginal examination. In any case of doubt, examination under anesthesia is required.

FIG. 45.—Diagram illustrating the three degrees of retroversion of the uterus. The third degree is often called complete retroversion. (*After Skene.*)

Pathology.—(1) The uterus is large, heavy and softer than normal; (2) it has a deep purple, mottled color, from chronic congestion; (3) varicocele of the broad ligament is common; (4) the endometrium is hypertrophied; (5) the tubes are congested; (6) the ovaries, being in secondary prolapse in Douglas' pouch, with the uterus lying on top of them, show a tendency to cystic formation; (7) adhesions are rare, except as a result of infection.

TREATMENT

Treatment may be (1) palliative or (2) operative. Cases which exhibit no symptoms require no treatment. Cases which show a tendency to abort, or there is associated sterility, require correction, even though no other symptoms are present.

Palliative Treatment.—*Indications:* (1) Recent traumatic retroversion; (2) retroversion shortly after childbirth; (3) non-adherent retroversion, where the patient makes the choice; (4) certain cases of adherent retroversion (treated by tampons).

A recent traumatic case (from a fall or severe jar) requires only reposition, under anesthesia if necessary, and no method of mechanical support is needed. As soon as the uterus is freed from the pressure of the uterosacral ligaments, between which it is caught, it resumes its normal position and stays there. Reposition in these cases is best done by rectal pressure.

Methods of Reposition. I. *Bimanual*—(1) The patient is arranged on a table, *not* a bed, in the dorsal position.

2. Two fingers of one hand are placed in the vagina, *behind the cervix.*

3. The uterine body is lifted, by these fingers, until the fingers of the other hand, on the abdomen, can catch behind the fundus and pull it forward. This maneuver can be assisted materially by a double tenaculum catching the anterior lip of the cervix. It will not succeed if the uterus is adherent, if the patient is fat or if she resists the examination.

II. *Reposition in the Knee-chest Posture.*—(1) The patient is arranged in the knee-chest posture, on a table; (2) the perineum is retracted by a Sims speculum; (3) the anterior lip of the cervix is caught with a double tenaculum; (4) with a repositor, in the posterior vaginal vault, the uterine body is pried, *not* pushed, forward, as the double tenaculum on the cervix is pulled down.

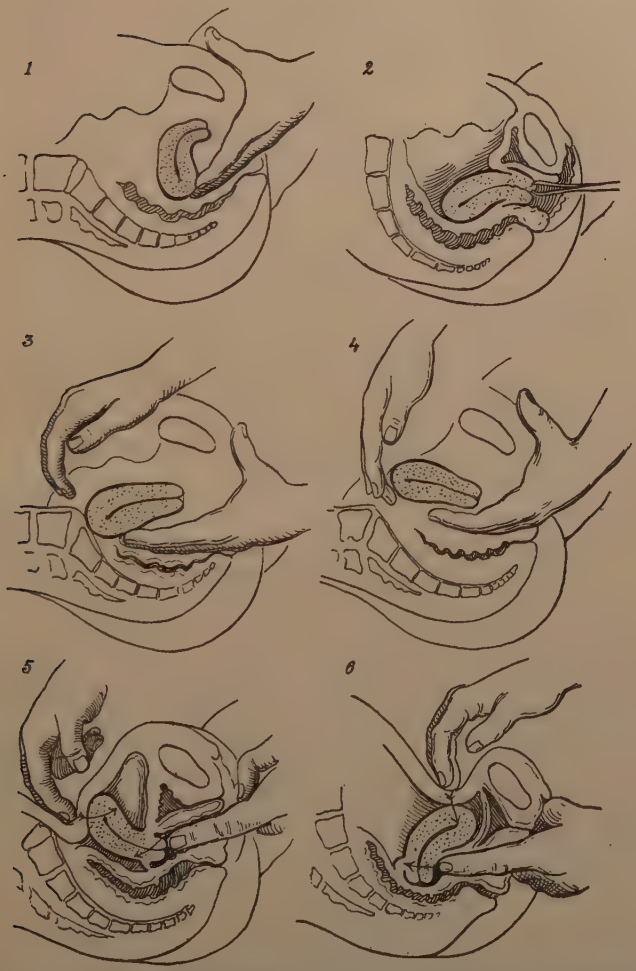

FIG. 46.—The different steps in bimanual reposition of a retroverted uterus. This is only possible when the patient is thin, relaxed, and the uterus is not adherent.

III. *Rectal manipulation* is often of value in both the above methods. It is best carried out with a curved, heavy sound; the finger is too short for the purpose.

IV. *The uterine sound* or more safely, a small intra-uterine Bozemann douche nozzle may be used, in cases which cannot be replaced by other methods, provided extreme asepsis and gentleness be observed. For this method the uterus *must not be adherent.* A bivalve speculum is inserted in the vagina and the cervix exposed; the cervix is wiped off with pledgets of cotton soaked in 1–1000 bichlorid solution; the sound, bent in a good curve, or the douche nozzle—if there is sufficient dilatation of the cervix—is passed into the uterine canal and the uterus gently pried forward. This method is useful in very fat women, but must be cautiously used and all instruments boiled.

V. *Anesthesia* may be required in any of the above methods.

VI. *Adherent retroversion* may sometimes be replaced by the following method: (1) The patient is arranged in the knee-chest posture, on a table; (2) the perineum is retracted by a Sims speculum; (3) a small wool tampon is grasped with placental forceps, dusted with boric acid powder, and placed in the posterior vaginal vault with as much pressure as the patient can stand; (4) other tampons are placed below this, until the vagina is full. A count is kept of the number used. (5) The tampons are removed by the patient, after forty-eight hours. She takes a vaginal douche, and returns to the office for a fresh supply. (6) The treatment lasts ten or twelve weeks, being interrupted during menstruation. If the patient has the patience to persist, this method is often successful.

Pessaries.—After a uterus is replaced, if it will not remain in place without support, it may be kept in proper position by a pessary. Except in cases immediately following the puerperium, a pessary is not a cure, simply a crutch, but patients can be kept comfortable for as long as they choose to wear it. The pessary requires regular inspection every six

to eight weeks, must then be removed, cleaned and replaced, and if the vaginal vault shows any sign of erosion, it must be left out for two to four weeks and the erosion treated by vaginal douching and boroglycerid tampons.

Kinds of Pessaries.—(1) *Hodge*—with a broad lower bar, usually uncomfortable because of pressure on the urethra, but valuable when there is slight relaxation of the outlet. (2) *Smith*, narrower at its lower end, and the most comfortable type. (3) *Thomas*—the same shape as the Smith, but with a very heavy upper bar, to span the angle of flexion in retro-

FIG. 47.—The three types of retroversion pessary in common use.

flexion. Pessaries are made of hard, vulcanized polished rubber.

How Retained.—(1) The fit of the shaped pessary to the vaginal canal; (2) the cervix, behind which the upper bar is hooked; (3) the pressure of the perineum; (4) the elastic and muscular tissues of the vaginal walls.

How it Acts.—As a lever in the vagina, the force of the short (upper) arm of the lever behind the cervix being exerted on the uterosacral ligaments and posterior vaginal vault. This pulls the cervix up and back and tilts the fundus forward.

Indications for a Pessary.—(1) Uterus free from adhesions; (2) a patient able to abstain from hard work; (3) uterus replaceable and in place when the pessary is inserted; (4) good perineal support (if the perineum is torn, the pessary will drop out as soon as the patient stands up); (5) ovary must not be prolapsed.

Contra-indications.—(1) A patient who must do hard work; (2) adherent retroversion; (3) prolapse of the ovary; (4) a uterus that cannot be replaced; (3) young single women (due to the narrow vagina and consequent difficulty of insertion and after care).

A pessary should never be inserted with the hope that it will pry the uterus into proper position.

Insertion of a Pessary.—(1) The patient is in the dorsal position; (2) the uterus is in proper position; (3) the pessary

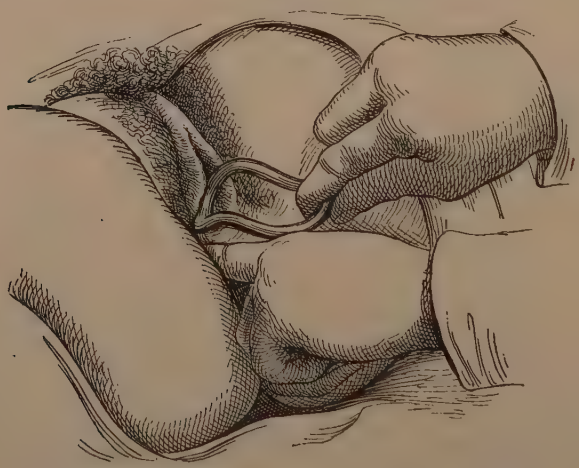

FIG. 48.—The first step in the insertion of a pessary. (*After B. C. Hirst.*)

is grasped by the lower bar and greased (glycerin); (4) the forefinger of one hand presses down in one vaginal sulcus; (5) the pessary is inserted obliquely in this sulcus, and upside down, for about one-half its length; (6) the pessary is turned right side up; (7) the forefinger of the other hand makes pressure on the upper bar of the pessary, carrying it up and behind the cervix (never in front of the cervix).

Qualifications for Proper Pessary.—(1) No portion of it is visible after insertion. (If so it is too long, and can be shortened by increasing the curvature.) (2) It should reach from

the posterior vaginal vault to the anterior vaginal wall, at the level of the internal urinary meatus. (3) There should be room to pass the finger all around it. (4) It should be the smallest that will satisfactorily support the uterus. (5) It should cause no pain. (6) It does not interfere with coitus. (7) In cases of retroflexion the Thomas pessary is used to span the angle of flexion.

It is not usually possible to find at the first trial a pessary satisfactory in all respects. The instrument must be fitted

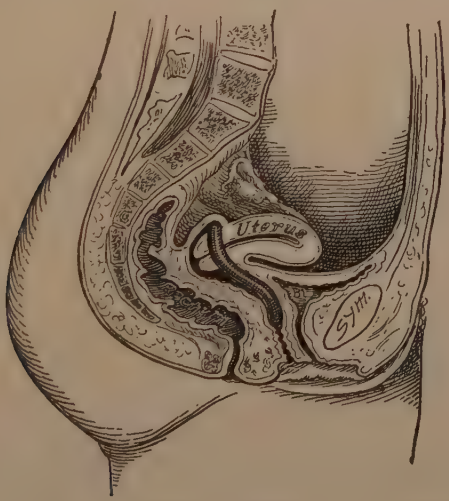

FIG. 49.—The pessary in position. (*After Skene.*)

to each case. The shape of the pessary can be varied by immersing in boiling water, moulded to the desired shape, and then plunged in cold water to harden it.

After-treatment.—The patient is told to report in two weeks, or sooner if she is uncomfortable. She then reports every four weeks, for three months. At each visit, the pessary is removed by hooking the forefinger *from below*, under the lower bar; the vaginal vaults are inspected through a bivalve speculum for possible erosion or irritation, and if none is found,

the pessary is reinserted. After three months, an attempt is made to do without the pessary, for two weeks; if the uterus is found in good position, and again four weeks later, the patient may be discharged as cured. If the displacement recurs, the pessary is again inserted for three months, with examination as before. If then, after the pessary has been worn for six months, the uterus will not stay in place without support, the patient is given her choice between the constant wearing of a pessary or operation. During the period of trial, the patient may undergo a course of pelvic massage and Swedish movements, designed to strengthen the pelvic muscles and ligaments, but of doubtful value.

The long-continued wearing of a pessary is not desirable. It requires constant watching, the pressure of it is irritating, it tends to aggravate any neurosis of the patient, and to convince the patient that she requires constant medical attention. Frequent vaginal douching while the pessary is worn is not advisable; a douche of salt solution twice a week is ample.

Operative Treatment for Backward Displacement of the Uterus.—*Indications:* (1) Adherent retroversion, when the uterus cannot be replaced; (2) a patient who must do hard work; (3) as an operation of election, after a pessary has been tried and has failed to keep the uterus in position; (4) when a pessary cannot be worn, due to the irritation it produces in the vagina; (5) in cases with associated tendency to abortion or with sterility, even though other symptoms are absent.

The ideal operation is one that (1) is free from risk; (2) does not open, or entails a minimum of invasion of the peritoneal cavity; (3) has a minimum of recurrences; (4) does not add any difficulty in future childbirth; (5) withstands subsequent childbirth.

As eighty-one different technics have so far been devised, it is obvious that no single operation answers all these factors. Those of most value are described below.

I. *Alexander operation* (Adams-Alquié-Edebohl's) the princi-

ple of which is the extraperitoneal shortening of the round ligaments in the inguinal canal.

Indications.—(1) Non-adherent retroversion, without suspicion of pelvic disease or appendicitis; (2) patient preferably under thirty-five; (3) patient not too fat.

Advantages.—(1) Extraperitoneal; (2) negligible percentage of failure; (3) never any trouble in subsequent childbirth; (4) withstands subsequent childbirth.

Disadvantages.—(1) Does not permit inspection of the pelvic organs or appendix; (2) unsuspected pelvic adhesions may cause subsequent pain; (3) inguinal hernia—this danger largely theoretical, as the operation properly done is really a Bassini for hernia.

The greatest disadvantage of the Alexander operation can be avoided by opening both internal rings, after the ligaments are found and stripped out. Adhesions can be broken up, the tubes inspected and the appendix removed. When the adhesions are very dense or pyosalpinx exists, this is not applicable, but for cases without gross pathologic lesions it is nearly ideal. The peritoneum of the rings is closed separately, and the rings themselves closed as the round ligaments are sewed fast.

Causes of Failure.—(1) Infection; (2) failure to pull out enough round ligament; (3) in a small percentage of cases, the round ligaments are too thin to give proper support, and very rarely they are entirely absent.

Very rarely the round ligaments run from the internal ring to the *anterior-superior spines*, instead of the pubic spines, a fact to be remembered when they cannot be found in their normal situation.

Technic.—(1) The patient is prepared as for any section, and anesthetized. The operation is not satisfactory under local anesthesia.

2. An incision is made parallel to the upper border of Poupart's ligament, for a distance of two or three inches from the pubic spine. This is extended through the superficial

fascia and fat until the fascia covering the inguinal canal is exposed. All bleeding vessels are caught and tied, as the wound must be dry.

3. Midway between the pillars of the external ring, the fascia over the inguinal canal is cut, in the same line as the skin incision.

4. The edges of the fascia are retracted with hooked retractors, and the round ligament is picked up on a blunt hook, from its position along the floor of the canal. The ilio-inguinal nerve lies just above it. The ligament can be recognized, when it is lifted, by its white color.

5. The band of cremasteric fascia, running along the ligament is cut, and the ligament, by blunt dissection with a pad, is stripped out of the internal ring for six or eight inches.

6. The wound is covered, and the opposite groin opened and the ligament stripped out in the same way.

7. Both ligaments are then pulled tense, crossed over the symphysis, and a hemostat clamped at the point of intersection. The fundus can be felt to bump against the anterior abdominal wall, as the ligaments are pulled on.

8. The ligaments are then sewed into the canal with a continuous stitch; each bite of the needle taking in turn: (1) The upper edge of Poupart's ligament; (2) the floor of the inguinal canal; (3) the middle of the round ligament (so as not to strangulate it); (4) the external oblique muscle; (5) the external oblique fascia. Number 1 chromic catgut is used, and the stitch ends at the pubic spine, closing the external ring.

9. The excess of ligament is cut off.

10. The skin and fat is closed as in any operation.

11. For six weeks it is desirable, except in young unmarried women, to have the uterus supported by a pessary.

II. *Alexander operation, with Pfannenstiel incision* is designed to utilize the principle of the Alexander operation and at the same time permit inspection of the appendages and appendix.

Disadvantages.—(1) It is exceedingly difficult to remove a badly adherent appendix, on account of limited room; (2) deep-seated hematomata are not uncommon, due to the extensive dissection; (3) there is some danger of injury to the bladder, in opening the peritoneum, as the wound is very near the symphysis.

Advantages.—(1) It permits inspection or removal of tubes, ovaries and appendix; (2) unsuspected adhesions can be dealt with; (3) the scar is almost entirely hidden in the pubic hair; (4) it withstands subsequent childbirth, due to the Alexander principle.

Technic.—(1) The patient is prepared as for any section and anesthetized.

2. The Pfannenstiel semilunar incision is made down to the fascia.

3. The inguinal canals are opened, and the round ligaments dissected out, as in the Alexander operation.

4. The two groin fascia wounds are then connected above the symphysis, the pyramidalis muscles cut loose, the rectus muscles separated and the peritoneum opened in the middle line, by a *vertical* incision.

5. The appendages and appendix are inspected, adhesions, if any, broken up and the uterus suspended by a single stitch of plain number 3 catgut, to act as a pessary.

6. The peritoneum is closed.

7. The round ligaments are sewed fast, as in the Alexander operation.

8. The rectus and pyramidalis muscles are repaired and the fascia, fat and skin closed as in any operation.

III. *Combined Alexander and Section.*

Indications.—(1) Cases where the uterus is adherent, the patient is not too fat, and is under thirty-five. Past this age, the round ligaments are often atrophied, and the risk of failure considerably increased.

Advantages.—Permits thorough inspection of tubes and ovaries and appendix, and allows proper management of any gross pathologic lesion.

Disadvantages.—None, except the theoretical one of three incisions, which, however, involve no mutilation or extensive dissection, and leave the patient in normal anatomical condition.

Technic.—(1) The patient is prepared as for any section and anesthetized; (2) both groins are protected with gauze sponges, soaked in 70 per cent. alcohol; (3) a short central incision is made and any necessary pelvic work done. The round ligaments are inspected, to make sure they are sufficiently thick and the abdomen closed at once; (4) the abdominal wound is covered with gauze and from this point the technic is the same as the Alexander operation. For any case where future childbearing is possible, this is one of the most satisfactory operations yet devised.

IV. *Ventrosuspension* (Hysterorrhaphy; Hysteropexy) is the suspension of the uterus, by sutures, against the anterior abdominal wall, just above the symphysis.

Advantages.—(1) The operation is quick and easy. It takes less time than any other method. (2) In patients who will never bear children, it is satisfactory.

Disadvantages.—(1) It pulls the uterus out of the pelvis; (2) it has a high percentage of failures; (3) it never withstands subsequent childbirth; (4) it cramps the bladder for room; (5) there is some danger of intestinal obstruction; (6) if the wound is infected, the silk or Pagenstecher stitches cause an annoying sinus; (7) as a result of infection, the uterus may be fixed, instead of suspended.

The uterus does not remain tight against the abdominal wall. In a few weeks, a suspensory ligament, about two inches long is formed, by which the uterus hangs in place. If the suspensory stitches take in the *fascia* of the anterior abdominal wall, the result is a *ventrofixation* of the uterus, which is to be avoided in women of childbearing age.

Indications.—(1) In patients past the danger of childbearing; (2) in ovarian cyst operations, as a precaution against secondary retroversion; (3) as an adjuvant in round liga-

ment operations; (4) in all other cases, with appreciation of the risks of failure.

Technic.—(1) The patient is prepared as for any section and anesthetized; (2) the abdomen is opened in the midline, and all necessary work done; (3) just before the abdomen is closed, the uterus is suspended by two silk or, better, Pagenstecher linen thread stitches passed through the peritoneum of one side from within, through the inner one-third of the

FIG. 50.

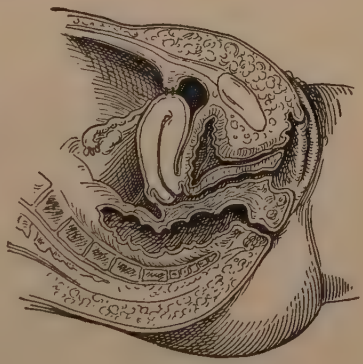

FIG. 51.

FIG. 50.—The suspension stitch in ventro-suspension. When the stitch is tied, and the flap of peritoneum closed over it, the stitch is in the peritoneal cavity, and less likely to cause a persistent sinus should the wound become infected. (*After B. C. Hirst.*)

FIG. 51.—A lateral view of the operation of ventro-suspension of the uterus completed. Notice how the bladder is cramped for room. (*After Crossen.*)

rectus muscle and down through the peritoneum again; through the fundus uteri, between the tubes, taking a bite one-half inch wide and one-quarter inch deep; through the peritoneum and inner one-third of the rectus muscle of the other side and down through the peritoneum again. When the knots are tied, they will be inside the peritoneal cavity. Catgut is *not* satisfactory, because of stretching and premature absorption. One stitch passes close behind the other through the fundus. If they are too far apart,

two suspensory bands may result, with possible intestinal obstruction; (4) an assistant, with one finger in the wound behind the uterus, keeps intestines out of the way until the knots are tied; (5) the abdomen is closed in the ordinary way.

V. *Baldy operation*, the principle of which is pulling the round ligaments through the broad ligaments, under the ovarian ligaments, and sewing the loops together behind the uterus in the middle line, fixing them to the uterus as well. The *Webster* operation is the same in principle, but the round ligaments are fastened where they come through the broad

FIG. 52.—The Baldy operation for retroversion, seen from above and from behind. (*After Graves.*)

ligaments instead of in the middle line. It is not nearly as satisfactory.

Advantages.—(1) Leave the uterus in normal position; (2) plenty of room for the bladder; (3) utilizes the thick ends of the round ligaments; (4) ovaries are suspended.

Disadvantages.—(1) Extensive adhesions from traumatism of the broad ligaments and uterus; (2) some difficulty in subsequent pregnancies, with added risk of miscarriage; (3) frequent recurrence of retroversion after delivery.

Indications.—Any case of retroversion where the appendages do not require removal, and the uterine attachments of the round ligaments are not interfered with.

Technic.—(1) The abdomen is opened in the middle line, as in any ordinary section; (2) any necessary abdominal work is completed; (3) the broad ligament of one side is held tense, through a bloodless space under the ovarian ligament a long hemostat is passed, and the round ligament caught about three inches from the cornu and pulled through the broad ligament; (4) the opposite side is secured in the same way; (5) the loops are sewed to each other in the middle line, and to the uterine body. They are spread out rather widely and secured with Pagenstecher thread near the fundus. If they are sewed low down on the uterus, the organ may fall backward over them; (6) the abdomen is closed as usual.

VI. *The Gilliam operation*, in which the round ligaments are pulled through the peritoneum and muscle, *under* the fascia, at either side of the lower end of the median abdominal incision, and sewed together in the midline and also where they emerge from the muscle. The *Mayo modification* of this tunnels under the fascia and catches the ligaments where they enter the internal ring and pulls them over to the middle line.

Advantages.—(1) Withstands subsequent childbirth fairly well; (2) ovaries are suspended.

Disadvantages.—(1) Owing to variation in the point of attachment of the round ligaments, the uterus is often not far enough forward, but points toward the umbilicus; (2) some danger of intestinal obstruction; (3) some danger of sloughing of the ligament, which is obviated if the ligament is not bruised in handling and the opening in the muscle is large enough not to constrict it.

Indications.—Any case where by removal of the tubes, the uterine attachments of the round ligaments are not interfered with.

Technic.—(1) The abdomen is opened in the ordinary way, by median incision; (2) any necessary intra-abdominal work is completed; (3) on each side of the wound, at its lower angle, a forceps is thrust through the muscle and peritoneum, the round ligament grasped midway in its course through the broad

ligament, and pulled through the opening made by the forceps; (4) the peritoneum is closed; (5) the loops of ligaments are sewed together in the middle line and also to the muscle, where they emerge, using number 1 chromic catgut; (6) the fascia, fat and skin are closed in the usual way.

VII. *Coffey operation*, a modification of the old Mann operation. The round ligaments are folded down the anterior face of the uterus as far as the peritoneal reduplication, and then back again to the cornu, and secured by suture.

Advantages.—None, over the above-described methods.

Disadvantages.—The same that caused the discarding of the Mann and similar operations: (1) Depends upon the thin

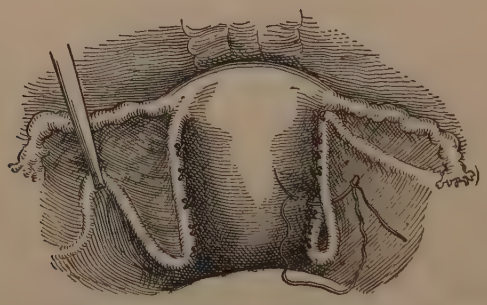

FIG. 53.—The Coffey operation for retroversion, seen from in front. (*After Crossen.*)

pubic end of the round ligament; (2) extensive adhesions from the suturing; (3) does not withstand subsequent childbirth; (4) high proportion of failures.

Technic.—(1) Ordinary abdominal incision and completion of intra-abdominal work; (2) the round ligament is carried down to the peritoneal reduplication on the anterior face of the uterus and held there by a stitch. It is then carried back to the cornu and held by another one; (3) the two layers of the ligament are sewed to the anterior face of the uterus, using number 1 chromic catgut; (4) a fold of peritoneum from the broad ligament is then sewed over the reduplicated round ligaments; (5) the abdomen is closed in the usual way.

VIII. Vaginal fixation of the uterus is *never* justifiable in women of childbearing age. It always causes severe dystocia. In women past the menopause, the most satisfactory technic is the Watkins-Wertheim interposition operation, as used in the cure of cystocele, but unless the patient has had children, the vaginal operation is better not attempted.

III. Cancer of the Fundus or Body of the Uterus

Cancer of the fundus or body of the uterus is seen usually at a later age than cancer of the cervix, forty-five to sixty being the usual. It is much less frequent than cancer of the cervix—about one-eighth. It is also more common in nulliparous women, just the reverse of cervical cancer.

Its progress is slow, it is slow to give metastases, and therefore is surgically more favorable than cervical cancer. Metastases take place into the deep sacral lumbar or renal glands, but may go into the groin along the lymphatics of the round ligament.

Symptoms.—(1) In over 80 per cent. of cases, the first symptoms appear after the menopause; (2) the first symptom is a watery, seropurulent uterine discharge, without odor and rather scanty; (3) then irregular bleeding, not profuse, but persistent; (4) a foul blood-streaked discharge, in the intervals of bleeding, as the growth begins to slough; (5) pain of an intense burning kind—a late and usually unfavorable symptom.

When the disease begins during menstrual life, it is often mistaken for profuse menstruation as an indication of the impending menopause—a most dangerous fallacy. Any irregular persistent bleeding in a woman past forty demands immediate investigation as to its cause.

Cancer of the body of the uterus is frequently found associated with fibroid tumor. If in a case of bleeding myoma, radical operation is for any reason deferred, a dilatation and curettage should always be done, to exclude cancer, especially if *x*-ray treatment or radium is to be begun. The rays often stimulate active growth of the malignant process.

Diagnosis.—(1) Bimanual examination of the uterus reveals practically nothing abnormal; at the most a uterus slightly enlarged; (2) specular examination shows a normal or slightly eroded cervix; (3) exploratory dilatation and curettage with microscopic examination of the scrapings is the only means of diagnosis, and should promptly be done.

Kinds of Cancer.—(1) Adenocarcinoma—much the commonest; (2) malignant adenoma; (3) chorionepithelioma. Squamous-celled epithelioma does not occur in the body of the uterus.

Treatment.—Abdominal panhysterectomy (Wertheim) is much the best. The technic is precisely that described under cancer of the cervix, with the following exceptions: (1) The uterine cavity is injected with strong (40 per cent.) formalin solution, to sterilize it; (2) the cervix is sewed up, to prevent leakage; (3) curetment and cauterization of the crevix are of course omitted.

Prognosis.—Favorable—about 75 per cent. should be permanently cured. The presence of adhesions is of great prognostic value, recurrence being much more likely if they are present. The operation is much easier than that for cancer of the cervix, and the primary mortality is low. When recurrence does take place it is as a retroperitoneal growth or as general abdominal carcinomatosis. Both are inoperable, and even palliative treatment by *x*-ray or radium offers little hope.

Chorion epithelioma (Deciduoma Malignum, Syncytial Cancer) is a most malignant growth, following labor, abortion or frequently hydatid mole. About one-half of the reported cases of chorion epithelioma have been preceded by hydatid mole. It arises from malignant proliferation of the syncytium, and gives most rapid metastases all over the body, but particularly to the lungs, vagina and brain. The nodules are soft, spongy, purplish in color. Microscopically they consist mainly of masses of syncytial cells and large blood spaces. It may occur coincident with pregnancy or hydatid mole, or at any interval up to several years thereafter.

Symptoms are usually irregular bleeding from the uterus occurring after the puerperium is completed, accompanied by a foul-smelling discharge. In many cases the appearance of metastases in the vagina is the first symptom detected. The uterus is large and soft and the os patulous. The diagnosis rests upon the microscopic examination of a portion of the tissue.

Treatment.—Abdominal panhysterectomy as soon as the diagnosis is made.

Prognosis.—If detected early and promptly treated by panhysterectomy, recurrence is unlikely. If seen in the stage when vaginal or other metastases have appeared, the outcome is dubious. Operation is always advisable, however, as metastases have been reported to disappear. The growth may occasionally be extruded like a miscarriage, and spontaneous cure result. It is usually the most rapidly growing and spreading of all the malignant tumors.

IV. Endometritis

Endometritis is the commonest disease of women. By itself it is rare, but it is associated, in a chronic hyperplastic glandular form, with most of the abnormalities of the pelvic organs.

Kinds.—(1) *Acute;* (2) *chronic*—the usual form. The causes of acute endometritis are (*a*) *sepsis;* (*b*) *gonorrhea;* (*c*) rarely infectious diseases like diphtheria, typhoid, etc. The causes of chronic are: (1) Chronic hyperplasia of the glands, secondary to chronic congestion of the uterus from any cause; (2) persistent after the acute form, as in gonorrhea; (3) tubercular—secondary to tuberculosis of the tubes; (4) syphilitic.

The types of chronic endometritis are (1) *Chronic hyperplastic glandular*—where the glands are enormously increased in number (much the commonest); (2) *chronic interstitial*—where the stroma is hypertrophied without corresponding increase of the glands; (3) *chronic atrophic*, where the glands

have disappeared and the stroma is represented by a thin fibrous band.

Causes.—(1) Acute septic, due to infection after labor, miscarriage or dirty instruments used in treatment; (2) acute gonorrheal, due to gonococcus; (3) acute infectious, due to intense hyperemia, caused by bacterial invasion; (4) tubercular is secondary to tuberculosis of the tubes; (5) chronic hyperplastic glandular and chronic interstitial are secondary to any pelvic condition causing chronic congestion of the uterus. These causes are so numerous, that chronic hyperplastic endometritis is the commonest disease of women; (6) atrophic is physiologic after the menopause and rarely seen at other times, except over the dome of a submucous fibroid.

Symptoms.—(1) Leukorrheal discharge, varying in kind and amount, depending on the cause. In sepsis it is seropurulent, bloody and usually foul. In gonorrhea profuse, yellow and irritating. In chronic endometritis it is milky; (2) erosion of the cervix; (3) usually menorrhagia, with increased frequency of menstruation. In acute infectious fevers, uterine bleeding justifies a diagnosis of acute endometritis; (5) rarely pain, except midway between the periods (Mittelschmerz). The cause of this pain is unknown.

Treatment.—Depends upon the cause. The acute septic form requires: (1) Rest in bed; (2) four hot vaginal douches a day; (3) ice-bag constantly to lower abdomen; (4) if after abortion or labor, a daily intra-uterine douche of tincture of iodin 3 drams, alcohol (95 per cent.) 8 ounces, sterile water q.s.ad. four pints; (5) *no curettage.*

The acute gonorrheal form is described in the chapter on Gonorrhea. (Chapter XVI).

Tuberculosis of the endometrium requires abdominal panhysterectomy, provided other important organs are not involved, and all apparent evidence of the disease can be removed with the uterus tubes and ovaries.

The treatment of chronic hyperplastic glandular endome-

tritis is: (1) The correction of its cause (retroversion, lacerated cervix or any other cause of chronic uterine congestion). Unless this is done, no permanent cure is possible.

Local treatment is (1) *Palliative* or (2) *Radical.*

Palliative treatment consists in (1) hot vaginal douching, twice daily; (2) boroglycerid tampons (both these of temporary benefit only); (3) instillations into the uterine cavity of argyrol 25 per cent., silvol 10 per cent. or nitrate of silver 1 per cent.; (4) in cases accompanied by bleeding, pituitrin ½ c.c. hypodermically twice daily for 10 doses.

Radical treatment consists of dilatation of the cervix and curettage of the uterine cavity. This is permissible only in chronic cases (except those of gonorrheal origin) and *never* in acute ones. The danger in acute or chronic gonorrheal cases is the prompt development of pyosalpinx.

Technic.—(1) The patient is prepared as for any plastic operation, and arranged in the dorsal position on a table (not bed). Anesthesia is necessary.

2. The anterior lip of the cervix is caught by a double tenaculum, and the cervix pulled down by an assistant.

3. A light Goodell dilator is inserted in the cervical canal and the blades separated to one inch on the scale.

4. A heavy Wathen dilator is inserted and the blades slowly separated, by the screw in the handle and not by manual pressure, until a transverse dilatation of one inch is secured.

5. With a sharp Sims curet, used with only the grasp of the thumb and two fingers, the uterine cavity is firmly and systematically curetted. The order is first the anterior wall, then the right lateral, posterior, left lateral and the fundus in the order named. As the soft velvety endometrium is curetted off, the curet grates on the harder muscle, this feel should be uniform all over the cavity before the curettage is discontinued.

6. A Martin spoon curet is used to curet out the angles of each cornu, as the Sims is too broad to enter them.

7. The uterine cavity is explored, for possible polyps, with

the Emmett curetment forceps. This is very important in cases where hemorrhage is a symptom. The curet will slip over surprisingly large polyps, without removing them.

8. The uterus is washed out through a two-way Bozeman catheter, with sterile water.

9. No packing is necessary, unless there is profuse bleeding, which is very rare.

10. The patient is kept in bed for seven days after the operation.

11. All scrapings should be examined microscopically.

Appearance of Curetted Material.—Some idea of the probable result of the microscopic examination is gained by the appearance of the curetted material.

(1) *Normal endometrium* is soft thick, dark red, infiltrated with blood; (2) *hypertrophied endometrium* is the same, with numerous whitish granules like sago; (3) *chorion* is white and shaggy, when floated out in water; (4) *decidua reflexa* is dark on one side, gray and shaggy on the other; (5) *old blood-clots* are jet black; (6) *cancer* is like brain tissue; (7) *chorion epithelioma* is dark purple and solid like a blood clot.

Regeneration of the endometrium after curettage takes place from the deep utricular glands in about five days. Too vigorous use of the curet may result in obliteration of the uterine cavity.

Perforation of the uterus during curettage is recognized by the sudden slipping in of the curet, far beyond the normal length of the uterus. In a clean case, the accident is not a serious one. All further manipulations should stop at once, and above all, the uterus *should not be washed out.* The patient should be put to bed and let alone. Abdominal section is unnecessary.

In a septic case: (1) Cease all further intra-uterine manipulations; (2) open the posterior vaginal vault; (3) pack Douglas pouch with gauze; (4) return to bed, in Fowler position; (5) continuous enteroclysis, 40 drops to minute. After forty-eight hours the gauze packing is removed and replaced

by a T drainage tube. Abdominal section is rarely needed, and then only if there are signs of peritonitis.

V. Fibroid Tumors of the Uterus (Myoma Uteri; Fibromyoma Uteri; Leiomyoma Uteri)

These are composed of fibrous and muscular tissue (the more fibrous tissue the harder the tumor) and develop in the wall of the uterus.

Frequency.—At least 50 per cent. of women have some degree of fibroid tumor. Most of them remain insignificant, cause no symptoms and require no treatment. A fibroid is rare in a woman under twenty-five years of age, and most tumors begin their growth between the ages of twenty-five and forty. New tumors rarely develop after the menopause, and rapid growth of a tumor at this time nearly always means sarcoma.

Cause is unknown; heredity plays some part; they are very common in single women past forty; and their frequency in negroes suggests a racial cause. As they develop only during menstrual life, the function of menstruation is a definite factor, and women who have not borne children are more likely to develop fibroids.

Site of development is chiefly in the wall of the uterus, above the internal os. Cervical fibroids are rare.

Kinds.—(1) *Interstitial* (intramural), when the fibroid is in the uterine wall; (2) *subserous*, when it has grown outward, toward the peritoneum; (3) *submucous* when it bulges into the uterine cavity; (4) *intraligamentary*, when it has grown into the layers of the broad ligament.

Bleeding is most profuse in *submucous* growths; least so in *subserous; pain* is most common in *submucous* (explusive) or in *intraligamentary* (pressure on sacral plexus).

A subserous myoma may grow outward, until it is attached to the uterus only by a pedicle. If this pedicle becomes twisted, it may slough through and the fibroid become *parasitic*, getting a meager blood supply from adherent omentum.

A submucous myoma may grow so far in the uterine cavity as to develop a pedicle and become a fibroid polyp. Due to efforts of the uterus to expel it, the pedicle is often so lengthened as to allow the polyp to hang outside the cervix.

General Life History.—Fibroids are of slow growth, usually moderate size, have a capsule, do not infiltrate the surrounding muscle, have poor blood supply and are nearly always multiple. The only fibroid which cannot be shelled from its capsule is the rare adenomyoma.

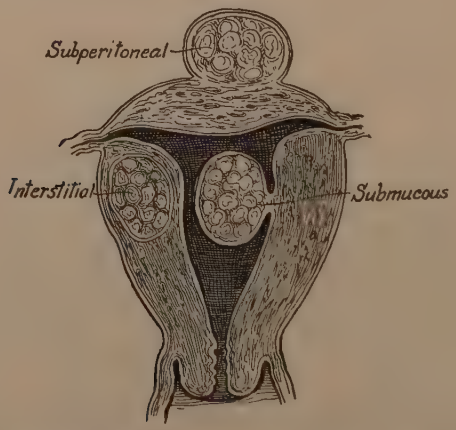

FIG. 54.—Showing varieties of uterine fibroma. (*After Stewart.*)

Degenerations.—(1) *Edematous* (cystic) due to passive congestion; (2) *hyaline* (unimportant, seen in portions of all fibroids); (3) *myxomatous* (really cystic edema); (4) *thrombosis* and *red degeneration* (seen in fibroids in pregnancy) dangerous because of infection; (5) *necrosis*—usually secondary to thrombosis in pregnancy; (6) *fatty*—most common in pregnancy, but also seen postmenopause; (7) *calcification*, usually postmenopause; (8) *malignant*—nearly always sarcoma. Carcinoma is possible by (*a*) invasion from the endometrium, or (*b*) carcinomatous degeneration of included glands, but is very rare. Pregnancy usually causes rapid

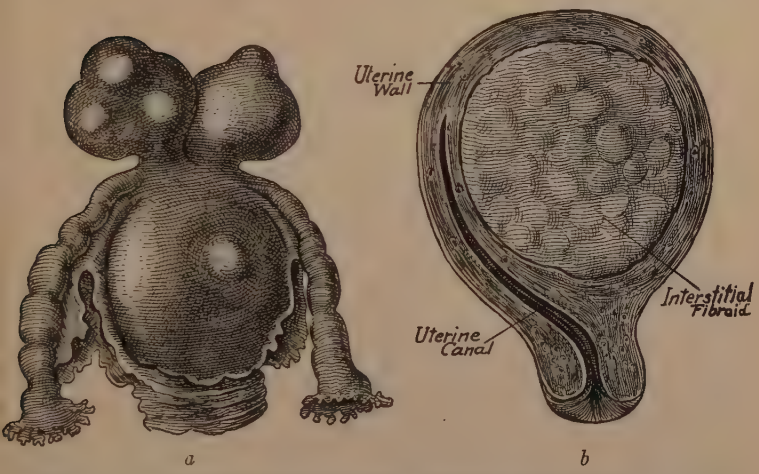

FIG. 55.—*a*, Multiple, subperitoneal fibroids of the uterus; *b*, large single interstitial myoma (fibroid) in the anterior uterine wall. This is the type that simulates pregnancy. (*After Graves.*)

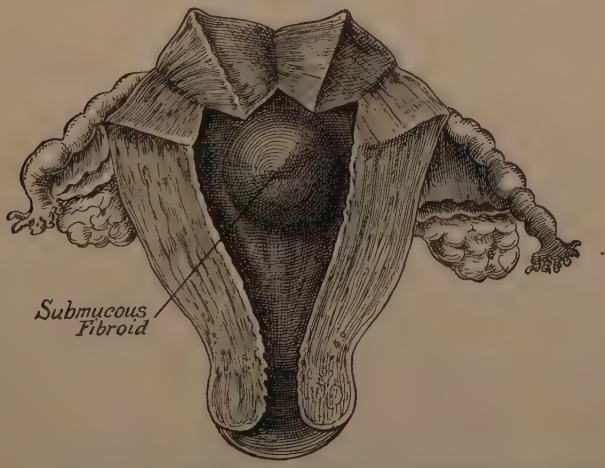

FIG. 56.—Moderate sized submucous fibroid. These growths cause the most bleeding, and are prone to become necrotic from reduction of their blood supply. (*After Graves.*)

growth in fibroids, due to the increase in blood supply. After delivery, the fibroid may shrink.

After the menopause, there is commonly a considerable reduction in size, but the presence of the tumor, especially if submucous, delays the appearance of the menopause for five to fifteen years. Adenocarcinoma of the endometrium, associated with fibroid tumor is not uncommon, especially after the menopause. This is entirely distinct from any degeneration of the fibroid itself.

Symptoms.—Many fibroids present no symptoms whatever, even though of large size. The symptoms depend to a large extent upon the situation of the tumor.

(1) *Bleeding.*—This is at first menorrhagia, due to a diapedesis through the vessels. The periods are at first lengthened, increased in amount with many clots, and later may be almost continuous. A secondary anemia always results, hemoglobin being as low as 25–30 per cent. A large subserous growth may cause no abnormal bleeding. Bleeding from a fibroid is always venous and therefore serious only by its long continuance.

(2) *Pain*—which is either expulsive (in submucous growths) or pressure, in subserous and intraligamentary. In the latter, sciatic neuralgia is common. In pregnancy, pain is often diffused over the whole tumor and is severe.

(3) *Presence of the tumor*, which when it reaches sufficient size, gives a bold outline to the abdominal enlargement, with sharp rise and fall. The tumor is usually irregular, nodular and very hard and firm. Large single submucous or intramural tumors give an outline startlingly like that of a pregnant uterus.

Secondary symptoms are: (1) *Anemia*; (2) *hyperthyroidism;* (3) *very irritable nervous system;* (4) *heart lesion* (compensatory dilatation, "*myoma heart*"). All these tend to return to normal after the removal of the tumor.

Diabetes is very common with fibroids.

A *foul vaginal discharge* usually means a necrotic gangrenous fibroid polyp and not malignancy.

Leukorrhea is common, being a thin serous discharge from the atrophied endometrium over the dome of a submucous fibroid, mixed with a thicker mucoid discharge from the hypertrophied glands around its base.

Effect of Fibroids on Pregnancy.—To some extent they prevent conception, about 30 per cent. of women with myoma being sterile. This is more than double the normal percentage.

Diagnosis is usually easy. Bimanual examination shows the hard, irregular nodular uterus, though there are many chances of mistake, such as: (1) A pelvic abscess or pyosalpinx adherent in Douglas' pouch—not a serious mistake as abdominal section is indicated in either; (2) a very tense ovarian cyst pushing the uterus far forward; (3) adenocarcinoma of the body of the uterus, causing moderate symmetrical enlargement. Only to be diagnosed by exploratory curettage; (4) a large symmetrical intramural or submucous fibroid may simulate most closely a pregnant uterus. Successive examinations, a week apart, will clear up the diagnosis. The most valuable single sign is the consistency of the cervix, which shows none of the softening characteristic of pregnancy.

TREATMENT

Treatment is either (1) palliative or (2) radical. Palliative treatment consists in (1) styptics; (2) dilatation and curetment; (3) electricity; (4) ovarian or mammary extract; (5) radiation —*x*-ray or radium.

Palliative Treatment.—*Indications:* (1) Small tumors, presenting as their only symptom moderate menorrhagia, with no suspicion of malignant degeneration; (2) tumors which are stationary in size or growing very slowly; (3) tumors which give no pressure symptoms; (4) women near the menopause, remembering always that the menopause may be delayed for five to fifteen years.

(1) *Styptics* are usually of little value and then only when

the bleeding is a moderate menorrhagia. *Pituitrin* ½ mil twice daily for two days before and the first two days of the period; *hydrastinin* gr. ½ by mouth four times daily during the period; *ergotin* gr. 1 (or 1 ampule aseptic ergot) hypodermically twice daily for the first three days of the period; a pill of *ergotin* gr. 1, *hydrastinin* gr. ½, *stypticin* gr. ½ (exceedingly expensive) four times daily for two days before and the first two days of the period are the most reliable, but not much is to be expected of them.

(2) *Dilatation and curettage*, in the hope of controlling the bleeding temporarily by removal of the hypertrophied endometrium or possibly a polyp, is often of value. It will be possible only if the uterine cavity is not distorted by nodular growths, hence it should not be attempted unless the uterus is fairly symmetrical in outline.

(3) *Electricity*—intra-uterine application of galvanic current, positive pole to the uterine sound, using a current of forty to sixty milliamperes for fifteen minutes three times a week for a series of thirty treatments, is of moderate value. It is contraindicated in tumors with severe bleeding, degeneration or in the presence of pelvic inflammation.

(4) *Ovarian extract* (gr. 5 four times daily by mouth); *Mammary extract* (gr. 5 four times daily by mouth); adrenalin ♏x of 1/1000 solution hypodermically or by mouth four times daily are all of practically no value, and while recommended from time to time by different authors, are not worth a trial.

(5) *Radiation*—either *x*-ray or radium—is the most valuable and powerful of all palliative agents, in spite of certain disadvantages. In young women there is danger of a permanent menopause, with both *x*-ray and radium. Neither have any effect upon the development of subsequent degeneration, and in cases of early and possibly unsuspected malignancy, may stimulate it to the utmost activity.

X-ray is attended with considerable danger of severe skin burns and the risk of burning is considerably increased in

severe anemia and, above all, syphilis. Often severe nervous disturbances follow its use.

With radium the danger of genital fistula is present, as the radium tube is inserted in the cervix and uterine canal. Radiation is not advisable in bleeding fibroids, after the menopause, as this symptom always means degeneration. Neither method is at all safe unless used by an expert, and the expense of radium removes it from the armamentarium of the general practitioner.

In spite of the dangers, radium remains the most efficient means of checking the bleeding of fibroids, and is the only method to be considered in those patients constitutionally unfit for surgical relief.

Radical treatment comprises (I) vaginal hysterectomy, (II) abdominal supravaginal hysterectomy; (III) abdominal myomectomy; (IV) vaginal myomectomy; (V) Battey's operation; (VI) ligation of the uterine arteries.

Indications.—(1) Large tumors with marked symptoms; (2) severe pain; (3) severe bleeding; (4) rapid growth —nearly always indicating sarcoma; (5) omophobia—the mental state of the woman who dwells upon the presence of the tumor and becomes practically mentally unbalanced upon this one point.

I. *Vaginal hysterectomy* has no advantage over abdominal hysterectomy, and is in most cases very much inferior to it. It must never be attempted if the bulk of the tumor is such that it cannot be delivered easily through the opening of the anterior vaginal vault. Its field is in fat women, in whom an abdominal section would be a formidable undertaking, or in women who, because of heart lesion, would not stand the Trendelenburg position usually required in abdominal hysterectomy. The best technic is supravaginal, extraperitoneal hysterectomy, but the uterus must be free from adhesion, whichever technic is chosen.

Technic.—(1) The patient is prepared for both abdominal and vaginal operation; (2) she is arranged in the dorsal position under anesthesia; (3) the anterior and posterior lips of

the cervix are caught with double tenacula and pulled down; (4) the anterior vaginal wall is incised longitudinally from the urethra to the cervix, and transversely across the cervix; (5) the flaps of anterior vaginal mucosa are dissected free from the bladder and the uterovesical ligament cut; (6) the bladder is pushed up, until the peritoneal reduplication is visible. This is opened and the uterine body pulled out through the opening with double tenacula. The presence of adhesions makes this step difficult, if not impossible; (7) the peritoneum of the prevesical space is sewed to the uterine body, as low as possible on the posterior wall. This shuts off the peritoneal cavity and the rest of the operation is extraperitoneal; (8) the ovarian artery is tied, the stump clamped in a hemostat and cut away. The round ligament is tied and cut, and these procedures repeated on the opposite side; (9) the uterine arteries are tied and cut, and the cervix amputated by a V-shaped excision, just above where the peritoneum has been attached posteriorly; (10) the cervical stump is closed by interrupted suture, and the vaginal wound sutured.

II. *Abdominal supravaginal hysterectomy* (in which a stump of cervix is left) is the operation of choice in the majority of cases. It is much easier and quicker than panhysterectomy. The only advantage of the latter is that it prevents subsequent development of cancer in the cervical stump, an occurrence so rare as to be negligible.

Supravaginal hysterectomy is indicated in (1) Women near the menopause; (2) very large tumors; (3) nodular tumors, in which the uterus is hopelessly involved; (4) degenerations; (5) pelvic inflammation.

Technic.—(1) The patient is prepared as for any abdominal section, and anesthetized.

2. The abdomen is opened, in the midline, by an incision long enough to permit delivery of the tumor.

3. The edges of the incision are held apart by a self-retaining retractor.

4. The uterus is grasped with a heavy volsellum, is delivered through the wound and held far forward over the symphysis.

5. The intestines are packed back by pads, so that none of them are visible, and Douglas' pouch is shut off by the pads.

6. The ovarian artery of each side is clamped, the round ligaments also, and a clamp placed above these, to control reflux bleeding.

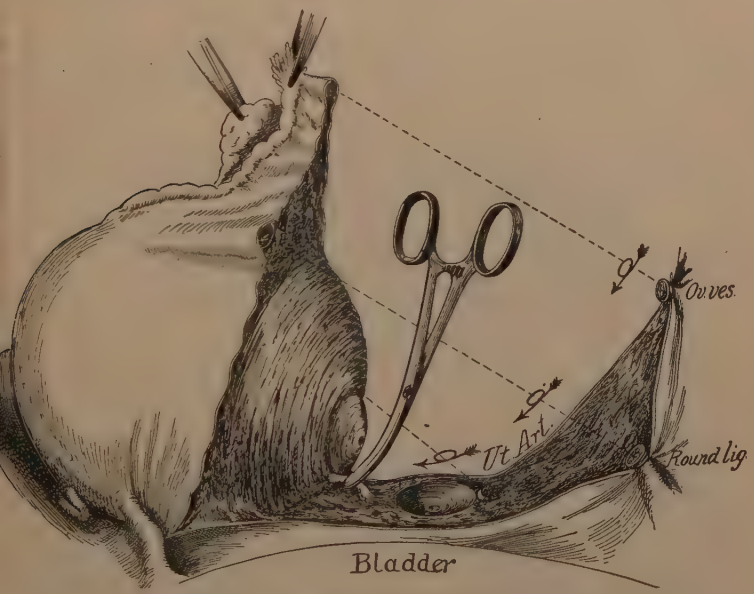

FIG. 57.—Left ovarian vessels tied, vesical peritoneum divided and pushed down, and left uterine vessels ligated. Cervix amputated and uterus pulled up and out, exposing right uterine artery, which is clamped an inch above the cervical stump. The two following steps are clamping the right round ligament and right ovarian vessels, when the mass is removed. (*Kelly.*)

7. The broad ligaments are cut between the hemostatic and reflux clamps, as far as the uterine artery.

8. The anterior peritoneal reduplication is cut, straight across, to connect the two incisions already made, and the bladder pushed down.

9. The posterior peritoneum is cut across, at the level of the attachments of the uterosacral ligaments.

10. The uterine arteries are clamped and cut and the cervix amputated by a V-shaped exsection.

11. The cervical canal is sterilized by the actual cautery.

12. The cervical stump is closed at once by interrupted suture of number 3 chromic catgut, taking the muscle but *not the peritoneum.*

13. The ovarian, round ligaments and uterine arteries are tied, across the pelvis in regular order, using number 3 chromic catgut.

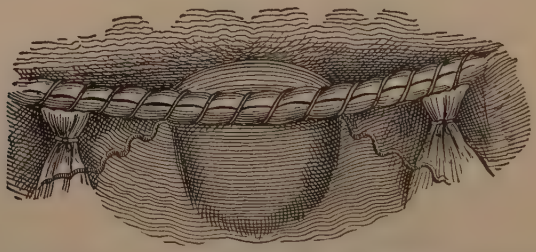

FIG. 50.—The stump of the cervix and broad ligaments, after completion of supravaginal hysterectomy.

14. The two layers of peritoneum are closed across the pelvis, by a continuous number 3 chromic catgut stitch, and the abdomen closed as usual.

15. It is doubtful whether leaving one or both ovaries, to prevent the surgical menopause, is worth while. Many of these cases require subsequent operation for cystic ovaries. The disagreeable symptoms of the menopause can be controlled better by hypodermic injections of corpus luteum extract.

Surgical Menopause.—In nearly all cases where the uterus, tubes and ovaries have been removed, prior to the natural menopause, the disagreeable symptoms of the surgical menopause (flashes of heat, tremors, nervousness, headache, etc.) can be relieved entirely by hypodermic intramuscular administration of either corpus luteum extract or *whole* ovarian extract, beginning on the fourth day after operation. The injections

are made deep in the deltoids, alternately, giving 1 mil a day (representing each 40 grains of the dried substance) for twenty-four doses, and repeating in series of twelve doses as the effects (which are cumulative) wear off. Usually forty-eight doses in all are required. • Several weeks separate the series of doses. The younger the patient, the more doses are needed.

III. *Abdominal myomectomy* is indicated when the tumor is single or, if multiple, can be shelled out without extensive mutilation of the uterus. It is absolutely contraindicated in (1) women near the menopause; (2) degenerations; (3) pelvic inflammation.

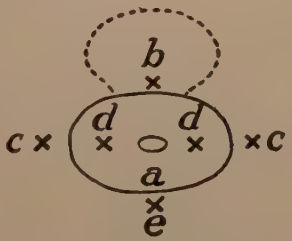

FIG. 59.–Points of entrance of the needle in infiltration of the cervix in local anesthesia by novocain or other solutions, preliminary to anterior vaginal hysterotomy. *a*, The cervix; *b*, anterior infiltration under the bladder; *c*, *c*, lateral infiltration; *d*, *d*, infiltration of the cervical muscle, parallel to the cervical canal; *e*, posterior infiltration. The crosses are the points of insertion of the needle.

Technic.—(1) The technic is the same as supravaginal hysterectomy, until the uterus is delivered from the wound.

2. The uterine wall is incised over the growth, until the capsule is opened, and the tumor is shelled out with the finger or spatula. The bleeding is negligible and no ligatures are required, as a rule.

3. The bed of the tumor is obliterated by interrupted sutures of number 3 chromic catgut, not involving the peritoneum.

4. The excess of capsule, uterine muscle and peritoneum is trimmed off, to secure an accurate fit in closing the wound.

5. The peritoneal coat is closed by continuous number 3 catgut suture.

6. Several separate growths may thus be enucleated.

7. When all are removed the abdomen is closed in the usual way.

Advantages.—(1) Leaves the uterus and does not establish the menopause.

Disadvantages.—(1) Danger of infection, especially if, during the enucleation of the tumor, the uterine cavity has been opened. (2) Other tumors, unnoticed during the operation, may develop later and require removal. (3) Danger of intestinal adhesions to the uterine wounds. (4) Weakens the uterine wall, in case of subsequent pregnancy. (5) The scar tissue, in extensive resections, may cause pernicious vomiting in subsequent pregnancies.

The operation is advisable in young women who wish, if possible, to bear children, and in women who for sentimental reasons prefer it to removal of the uterus. In other cases, the disadvantages should be fully weighed before performing it.

IV. *Vaginal myomectomy* is indicated in intra-uterine growths (polyps) even of considerable size, or in necrotic fibroid polyps.

Technic.—(1) The patient is prepared for both plastic and section, (the latter in case it proves impossible to remove the tumor by the vaginal route); She is arranged in the dorsal position under anesthesia.

2. The anterior lip of the cervix is caught with a double tenaculum and the canal dilated. Unless the growth is small, dilatation of the cervix does not give sufficient room. In many cases, the anterior vaginal wall must be separated from the bladder, the bladder pushed up and the cervix cut in the middle line, through the internal os (anterior vaginal hysterotomy).

3. The growth is caught with a volsellum, and if it has a pedicle, it is twisted off and removed.

4. If the attachments are firm (as they usually are) the capsule is incised near the base, with scissors, and the growth enucleated with the finger, strong traction downward being made on the volsellum holding it.

5. If the growth is of large size, it is necessary to remove it piecemeal, cutting off piece after piece with heavy scissors (*morcellation*).

6. The hysterotomy wound in the cervix is repaired with

interrupted sutures of number 3 chromic catgut, and the vaginal walls sewed back in place.

7. The uterine cavity is washed out, and the vagina packed with sterile gauze, which is removed in twenty-four hours. Uterine packing is rarely needed, and only if there is persistent bleeding.

V. *Battey's operation*—double oöphorectomy to secure shrinkage of the fibroid by establishing the surgical menopause—is an illogical procedure now rarely used.

VI. *Ligation of the uterine arteries*, to starve the tumor by shutting off the major portion of its blood supply, has been extensively recommended, but is now obsolete.

Fibroids in pregnancy are often stimulated to excessive growth. They should be let alone, unless they cause severe pain, severe bleeding or grow alarmingly. Myomectomy is to be preferred to hysterectomy, to allow, if possible, the continuance of pregnancy.

RECURRENT FIBROIDS

Recurrent fibroids, so called, after supravaginal hysterectomy, are sarcomata, and are inoperable. They should be treated by massive doses of radium, in repeated short exposures, but the prognosis is bad.

ADENOMYOMATA

Adenomyomata are a special type of fibroid. They grow diffuse in the uterine wall, contain glands identical with those of the endometrium (from which they are derived) and embedded in endometrial stroma. They develop mostly in the posterior uterine wall, near the fundus. They are usually small, and do not as a rule produce serious symptoms.

Symptoms.—(1) Menorrhagia; (2) menstrual pain; (3) moderate asymmetrical enlargement of the uterus.

Treatment.—*X*-ray, radium or hysterectomy, if the symptoms are sufficiently severe.

These tumors are prone to malignant degeneration, which is *carcinoma* from the enclosed glands.

VI. Hysteralgia

Hysteralgia or excessive pain referred to the uterus, without demonstrable cause, is usually rheumatic. It is sometimes so severe as to simulate peritonitis, though the absence of fever, rapid pulse and high leukocyte count will differentiate it.

The **treatment** is aspirin gr. 10 four times daily, which will promptly relieve the pain. A single dose of morphin sulphate gr. ¼ hypodermically at the onset is justifiable, but should not be repeated.

VII. Infantile Uterus

Infantile uterus is of two types: (1) Dwarf uterus, where the uterus is much below the normal size, but perfectly proportioned; (2) disproportion of cervix to body, so that the cervix is much longer than the body, though both are below normal. This is much the commoner form.

Causes.—(1) Congenital, (2) superinvolution after childbirth; (3) repeated curettage of the uterus (really another cause of superinvolution).

Symptoms.—(1) Scanty menstruation, often with long intermissions between the periods; (2) dysmenorrhea; (3) sterility.

Treatment.—(1) Dilatation of the cervix, without curettage, to relieve dysmenorrhea; (2) hypodermic injections intramuscularly of 1 mil corpus luteum extract, daily doses in series of twelve doses, with two weeks' intermission between series; (3) electrical stimulation, with negative pole to uterine sound, using galvanic, slow faradic and sinusoidal current for fifteen minutes each (total forty-five minutes for each treatment) every other day for six to eight weeks. Much better results can be hoped for in acquired infantilism (superinvolution) than in the congenital form.

VIII. Inversion of the Uterus

Inversion of the uterus is one of the rarest of diseases of women, and nearly always occurs as a complication of childbirth.

Kinds.—(1) *Acute*—due to traction of the placenta after delivery; (2) *chronic* due to prolonged traction of tumors; (3) *incomplete*, where the fundus does not pass the cervix, (4) *complete*, when the fundus is in the vagina.

Causes.—(1) Traction of the placenta—either spontaneous or due to manual efforts at extraction—after labor. (2) Prolonged traction of fibroid polyp.

Symptoms.—In the *acute* variety (1) shock; (2) hemorrhage; (3) fundus felt in the vagina; (4) abdominal palpation shows a deep cleft across what remains of the uterine body. This variety requires immediate manual reposition, and its symptoms are so alarming that it can hardly be overlooked or neglected. Occasionally it does persist, however, and becomes chronic.

Symptoms of Chronic Inversion.—(1) Bleeding—irregular and profuse; (2) considerable leukorrheal discharge, often offensive; (3) bimanual examination shows a tumor in the upper vagina, surrounded by a collar of healthy cervix; (4) also that the uterine body cannot be felt, but if the deep pressure above the symphysis is made, a deep cleft extending across what remains of the corpus uteri; (5) a uterine sound will show that there remains no uterine cavity.

Differential diagnosis is from myomatous polyp. This forms a polypoid mass, surrounded by a collar of healthy cervix, and causes bleeding and discharge, but here the resemblance ceases. The uterine body is plainly felt, there is no depression across it, the uterine cavity is not obliterated and is always longer than normal.

Complications.—(1) Contraction of the cervix (always present in the chronic variety, and occurring in the acute after a

few hours). (2) Gangrene of the corpus uteri, where the cervical contraction is tight enough to cut off circulation.

Treatment (of the chronic variety).—(1) Attempt to reduce the inversion by taxis, like a hernia, will almost certainly fail.

(2) Long-continued pressure, by gauze packing, renewed every twenty-four hours; a ball and stem pessary, supported by a belt and perineal straps. Both have been occasionally successful, but there is considerable danger of sepsis.

(3) *Operative treatment*, by far the simplest, safest and quickest.

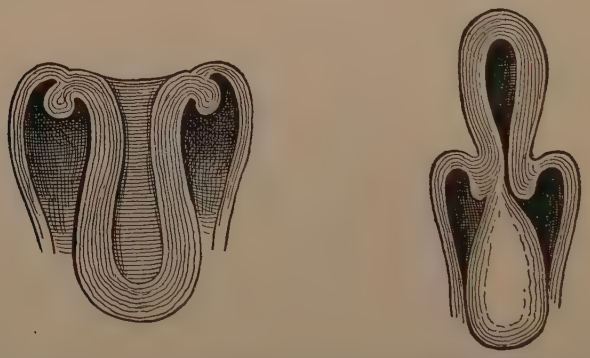

FIG. 60.—Diagram to illustrate the differential diagnosis between inversion of the uterus and a fibro-adenomatous polyp protruding from the cervix.

Methods.—(1) With the patient in the dorsal position, anesthetized, the cervix is held with tenacula, and cut posteriorly in the midline, far enough to relieve constriction. The uterine body is replaced and the cervical cut repaired. This will succeed in the vast majority of cases.

(2) *Spinelli Operation.*—The bladder is separated from the cervix, as in anterior vaginal hysterotomy. The uterus is split in half, along its anterior border, as far as the fundus. It is re-inverted, and the uterine and vaginal wounds closed. This is merely an extension of the first operation, is much more formidable and usually unnecessary.

(3) Abdominal section for the relief of inversion is never necessary.

(4) If the fundus is gangrenous, vaginal hysterectomy should be performed.

IX. Metritis

Acute metritis is exceedingly rare, outside the puerperium. It is due to bacterial invasion, usually streptococcic. The moderate inflammatory and circulatory changes occurring as a result of prolonged congestion from any cause is usually called chronic metritis, though it is not, strictly speaking, inflammatory. As a result, there is a fibrous change in the myometrium, the muscle becoming almost like cartilage. True bacterial invasion may occur, independent of the puerperium, from (1) gonorrhea; (2) tuberculosis; (3) dirty instruments used in treatment.

Symptoms of the acute form are those of acute sepsis, and treated by rest in bed, ice bag to the lower abdomen, hot vaginal douches and stimulation.

Symptoms of the chronic form are: (1) Backache; (2) bearing-down pain in pelvis; (3) bleeding—at first menorrhagic and later continuous and profuse; (4) leukorrhea; (5) blood-tinged mucous discharge midway between periods, with considerable pain; (6) as this form of metritis is often seen in syphilis, a Wassermann test should always be made.

Bimanual examination shows a large, heavy and very firm uterus.

Treatment.—(1) Correction of any cause of chronic congestion of the uterus which may be found; (injuries of childbirth being the most common); (2) styptics such as ergotin gr. 1 four times daily, hydrastinin gr. 1 four times daily, pituitrin one-half mil hypodermically twice daily for ten doses; (3) dilatation and curettage to remove hypertrophied and angiomatous endometrium; (4) radium, in massive doses with short exposure; (5) *x*-ray— with due regard to the danger of burning; (6) salvarsan, if due to syphilis; (7) abdominal hysterectomy, if all other means have failed.

X. Polyps

Polyps are of two kinds: (1) Small mucous polyps of the endometrium; (2) fibromyomatous polyps, sessile or pedunculated, varying in size from a cherry to the fetal head. The latter are submucous myomata which have grown down into the uterine cavity. Uterine polyps are much less common than cervical ones.

Symptoms.—(1) Menorrhagia, becoming metrorrhagia; (2) moderate leukorrheal discharge; (3) often expulsive pain, from the uterus trying to expel a myomatous polyp, as a foreign body; (4) mucous polyps cause no enlargement of the uterus; fibromatous often cause a very considerable increase in size.

Treatment.—Dilatation and curettage, followed by exploration of the uterine cavity with placental forceps. This is most essential, as the curet will slip over polyps that the placental forceps will grasp and extract. If a pedunculated myomatous polyp is found, it can be twisted off and removed. A sessile polyp, with a broad attachment, requires anterior vaginal hysterotomy (to secure sufficient dilatation) and enucleation after its base has been incised with scissors. A polyp too large to be removed whole must be cut in pieces (morcellation). In every case, both polyp and endometrial scrapings must be examined microscopically, for carcinoma. As polyps are often multiple, the operator must search the uterine cavity thoroughly and not be satisfied that with the finding of a single polyp his operation is complete.

Degenerations.—(1) Necrosis and sepsis. These are most common in elderly women, who are bad surgical risks. The tumors are so soft and friable that, if they can be easily reached, they can be removed with the forceps, without anesthesia. (2) Malignant degeneration, diagnosed only by the microscope, is an absolute indication for panhysterectomy.

XI. Prolapse of the Uterus

Prolapse of the uterus is, in the vast majority of cases, a consequence of childbirth, and will be discussed in its proper place in Chapter XIII.

Prolapse is possible in nulliparous women, independent of childbirth, from the following *causes:*

1. Congenital (rare, but the most likely cause in young girls). (2) Excessive muscular effort. (3) Rupture of an ovarian multilocular cyst, with the weight of the extruded fluid causing total prolapse of the uterus and inversion of the vagina. (4) Ascites, having the same effect. (5) In elderly women, due to increased intra-abdominal pressure and relaxed tissues, post-menopause.

Congenital prolapse in young girls is usually only apparent, being due to a great supra- and infravaginal hypertrophy of the cervix, the uterine body remaining at or near its proper level. These cases are relieved by amputation of the cervix. The other cases are usually true prolapse, of which the palliative and curative treatment is identical with that for cases due to childbirth, described in Chapter XIII.

XII. Sarcoma of the Uterus

Sarcoma of the uterus is forty times less frequent than carcinoma.

Point of origin is either (1) the connective tissue of the endometrium; (2) connective tissue of the myometrium. That from the endometrium is very rare; that from the myometrium is almost invariably a degeneration of a fibromyoma and is called *myosarcoma.*

Sarcoma of the endometrium is usually polypoid, most commonly in the cervical canal and hangs from the cervix like a bunch of purple grapes—*hydatidiform sarcoma of the cervical canal.* Rarely sarcoma of the endometrium is diffuse, and invades the uterine wall as does carcinoma. Sarcomatous degeneration of a fibroid usually starts in the center of the growth and spreads rapidly. On section it appears gelatinous.

Age of occurrence is usually thirty to fifty, the disease being very rare either side of these limits.

Histology.—(1) Mixed-cell sarcoma is the commonest; (2) spindle cell next in frequency; (3) sarcoma of the endometrium

is usually round-cell; (4) very rarely it is melanotic; (5) also very rarely, carcinoma and sarcoma are found in the same uterus.

Symptoms.—(1)Bleeding; (2) foul discharge; (3) pain; essentially the same as carcinoma. Hydatidiform sarcoma of the cervix is recognized at a glance, though a piece must be excised and examined microscopically. Sarcoma of the endometrium of the corpus uteri can be diagnosed only by curettage and microscopic examination. Sudden growth in a fibroid, particularly with ascites, usually means sarcomatous degeneration and is an indication for immediate panhysterectomy. About 3 to 5 per cent. of fibroids undergo sarcomatous change.

Persistent bleeding from the vagina in children, before puberty, if precocious menstruation be eliminated, is most often due to cervical sarcoma.

Metastasis is much more common and occurs earlier than in carcinoma, hence the operative results are less favorable. Diffuse sarcoma gives metastasis earliest, next is the polypoid type, and latest is sarcoma of a fibroid. Metastasis occurs to distant portions of the body, is very common retroperitoneally, and often appears as a general sarcomatosis.

Treatment.—Abdominal section, with panhysterectomy if possible, as soon as the diagnosis is made. Palliative treatment is unsatisfactory, neither *x*-ray nor radium having much, if any, effect. In degenerated myomata, *x*-ray and radium are positively contraindicated, as they stimulate the malignant process to new activity.

Prognosis is best in degenerated fibroids, recurrence being about 50 per cent. In other types, recurrence is almost invariable, either locally or by distant metastasis.

XIII. Subinvolution of the Uterus

Subinvolution of the uterus is the failure of the uterus to regain its normal size after childbirth or miscarriage. The condition is always secondary to a primary cause, and is due to congestion or failure of firm contraction.

Causes.—(1) Retained portion of the ovum; (2) lacerations; (3) displacement of the uterus; (4) hypertrophied decidua; (5) puerperal sepsis; (6) peri-uterine adhesions.

Symptoms.—(1) Bearing down and backache; (2) headache (vertical or occipital); (3) leukorrhea; (4) metrorrhagia; (5) bladder irritability.

Diagnosis is easily made by bimanual examination, the uterus being larger and less firm than normal.

Treatment is the removal of the cause. If this is done, the uterus rapidly regains its normal size, without further treatment. The process can be hastened by (1) hot vaginal douches, three times daily; (2) tincture of digitalis ℥v t. i. d.; (3) hypodermic of pituitrin ½ mil twice daily for six doses; though these measures are unnecessary.

XIV. Superinvolution of the Uterus

Superinvolution of the uterus is an exaggerated reduction in size of the uterus. It is much rarer than subinvolution.

Causes.—(1) Hyperlactation; (2) pelvic inflammation; (3) hemorrhage; (4) rapidly repeated pregnancies; (5) repeated curetment of the uterus, at short intervals.

There is a moderate form, common during lactation or after miscarriage, occasionally going to extreme diminution in size, called *lactation atrophy*. The uterine walls are thin and easily perforated, a fact to be remembered in curetments on nursing mothers or after miscarriage.

Diagnosis.—Bimanual examination shows a uterus much reduced in size, sometimes so small as scarcely to be felt.

Treatment.—Spontaneous return to normal or near normal size, is the rule, if the cause be found and removed. In cases without obvious cause: (1) Electrical stimulation of the uterus, negative pole to uterine sound; galvanic, slow faradic and sinusoidal currents each fifteen minutes (total forty-five minutes for each treatment) three times weekly; (2) hypodermic extract of corpus luteum 1 mil (representing 40 grains

of the dried substance) daily in series of 12 doses; (3) hypodermics of whole ovarian extract, in the same dosage. Rarely the condition resists all treatment and is permanent.

XV. Tuberculosis of the Uterus

Tuberculosis of the uterus is usually confined to the endometrium, and is nearly always secondary to tuberculosis of the tubes. It is found in patches in the endometrium and only rarely invades the muscle.

Symptoms.—(1) Persistent leukorrhea; (2) rarely bleeding; (3) occasionally long-continued amenorrhea.

Diagnosis.—By bimanual examination the uterus is slightly enlarged, fixed and the salpingitis associated with it can be felt. Exploratory curettage and examination of the scrapings is useful as a diagnostic measure, but is never curative, as the disease is secondary to the tubes.

Treatment is abdominal section, with double salpingectomy, and also hysterectomy, if curettage has shown the endometrium to be extensively involved.

Prognosis, in the absence of extensive active foci elsewhere in the body, is good. If these foci are present, any operation for tuberculosis of the uterus is not worth while.

CHAPTER VIII

DISEASES OF THE FALLOPIAN TUBES

I. NORMAL ANATOMY AND RELATIONS OF THE FALLOPIAN TUBES

The Fallopian tubes run from each cornu of the uterus, through the upper layer of the broad ligaments, to the ovaries, with which the lower fimbriæ of the tube are usually in

FIG. 61.—Section of the normal Fallopian tube near the uterine cornu. (*Beyea.*)

contact. They are about 12 cm. long, the left being slightly the longer

Structure.—The tubal walls consist of a mucous, muscular and serous coat. The mucosa is in longitudinal folds, simple

and slightly elevated in the inner portion; exceedingly complicated and well marked in the outer third and the ampulla. There are no glands and no submucosa; the cells are columnar and ciliated, the cilia lashing toward the uterus.

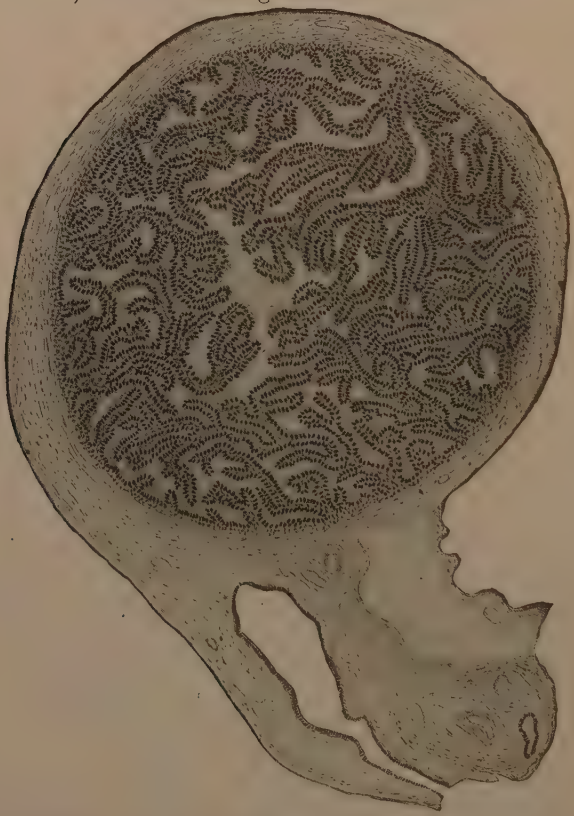

FIG. 62.—Section of the normal Fallopian tube near the abdominal ostium. (*Beyea.*)

The muscular coat is in three layers: (1) An inner longitudinal (not well marked); (2) a middle circular and (3) an outer longitudinal.

The serous coat is in three closely knit layers, and is best marked in the inner two-thirds of the tube.

The *caliber* of the tubes, is, at the uterine end, that of a bristle of an average hairbrush. It increases steadily toward the fimbriated extremity, where it is the size of a goose quill (.8 cm.).

Divisions.—(1) *Uterine mouth* (funnel-shaped) in each cornu; (2) *interstitial portion* (that running through the uterine wall); (3) *isthmus* (the narrow portion of the inner one-half); (4) the *tube* proper; (5) the *infundibulum* (the expanded outer third of the tube); (6) the *fimbriæ* (folds of mucosa at the abdominal end).

The portion of the broad ligament through which the tube runs is called the *mesosalpinx*.

Arteries are four or five small branches from the utero-ovarian anastomosis.

Veins accompany the arteries; they terminate in the ovarian and uterine veins. The left side is more subject to engorgement because the left ovarian vein empties into the left renal vein at a right angle and has no valve, while the right ovarian vein empties into the inferior vena cava and has a well-marked valve. For this reason, which favors congestion, and because the rectum dips down behind the broad ligament on the left side, pain from inflammatory reaction is usually more marked on the left than on the right side.

Lymphatics empty into the deep lumbar glands.

Nerves come from the uterovaginal and ovarian plexus. There is a well-marked tubal plexus in the subserosa.

Hydatid of Morgagni is a small cyst, representing the terminal end of the Müllerian duct, hanging from the ovarian fimbria by a long slender pedicle. It has a connective tissue wall, is lined with pavement epithelium, and contains a clear serum. Its maximum size is that of a hazelnut.

II. CONGESTION OF THE FALLOPIAN TUBES

Congestion of the tubes without inflammation, is always secondary to some interference of the circulation, most com-

monly from retroversion of the uterus. There are no symptoms by which the condition can be diagnosed; it is seen at operation, when the tubes are inspected. The tubes are dark red or purple, swollen, and usually blood can be expressed from the lumen. The canal is not obstructed, and it is not necessary to remove them. The congestion disappears when the cause is removed.

In intraligamentary ovarian cyst the tube is stretched over the top of the cyst, congested and enormously elongated (one case thirty inches long).

III. EXTRA-UTERINE PREGNANCY (ECTOPIC GESTATION; TUBAL GESTATION)

Extra-uterine pregnancy may occur at any point from the peritoneal cavity (primary abdominal pregnancy) to the intramural portion of the tube (cornual pregnancy). It is most common in the outer one-third of the tube.

Causes.—(1) Some interference with normal progress of the ovum through the tube, most likely adhesions from a previous salpingitis, or from destruction of the cilia of the epithelium. (2) Lodging of the ovum in a diverticulum of the tube (rare). (3) Unusually long and convoluted tubes. (4) External transmigration of the ovum (from the right ovary to the left tube or *vice versa*).

In the last two, the length of the journey is such that before it is finished the ovum is too large to progress further.

Classification.—(1) Tubal (much the commonest); (2) ovarian; (3) abdominal; and (4) combinations of the above, such as tubo-uterine (cornual); tubo-ovarian, etc.

Primary abdominal pregnancy is where the fertilized ovum lodges in the peritoneal cavity; *secondary abdominal pregnancy* is one which began in the tube, escaped through the fimbriated extremity into the peritoneum, and there continued its career.

Frequency is said to be one in five hundred cases, and most often between the ages of twenty and thirty years. Tubal pregnancy is by far the commonest. Ovarian pregnancy is

exceedingly rare. Primary abdominal pregnancy is also very rare but secondary abdominal pregnancy, where the embryo was originally in the tube, but escaped into the abdominal cavity and there continued its development for some time is not very uncommon. In such a case a child may die at the time of its extrusion into the abdominal cavity, and be retained as a lithopedion for an indefinite time (fifty-six years in one case), or it may partially absorb and the bones ulcerate through into the bowel or bladder; or it may continue

FIG. 63. The possible sites of extra-uterine pregnancy: 1, Cornual or interstitial; 2, tubal in the isthmus; 3, tubal; 4 and 5, ampullar. Ovarian and primary abdominal pregnancy are exceedingly rare. (*Gilliam.*)

its development until term, or past it, and be delivered alive by abdominal section.

Development.—In the tube the ovum behaves much as it does in the uterus. It burrows into the mucosa; this is imperfectly transformed into decidua and the chorion and amnion develop as in normal pregnancy. Decidua is also formed in the uterine cavity, but is not as thick as in normal pregnancy. This decidua after the death or removal of the embryo is cast off, but sometimes must be removed by curetment.

Terminations.—Most commonly *tubal abortion*, or extrusion of the ovum through the dilated fimbriated extremity of the

tube, with more or less severe hemorrhage, at about the sixth to tenth week of pregnancy. Next in frequency, *erosion* of the tubal wall (the so-called rupture) with severe internal hemorrhage; erosion of the tube with hemorrhage into the layers of the broad ligament; the conversion of the fetus into a lithopedion or calcification of the fetus; rarely death of the embryo and complete resolution.(?) A tubo-uterine or inter-

FIG. 64.—The site of the hematocele in extra-uterine pregnancy, felt as an exceedingly tender mass in Douglas' pouch. (*After Crossen.*)

stitial pregnancy may make its way into the uterine cavity and progress normally to term and very rarely a tubal pregnancy may develop to term. Tubal pregnancy not infrequently occurs twice in the same individual. Rarely combined extra-uterine and intra-uterine pregnancy have been found.

Pelvic hematocele is the collection of blood in Douglas' pouch, palpable by vaginal examination. It is soft and doughy, and may reach a very considerable size, being often palpable by abdominal examination, and extending as high as the umbilicus. When the tube ruptures, or the ovum is

extruded through the fimbriated extremity, the embryo is usually rapidly absorbed, and no trace of it is found in the mass of blood-clots forming the pelvic hematocele.

The uterine bleeding associated with ectopic pregnancy is venous in origin, comes from the endometrium and is *never* by reflux from the tube.

Clinical History and Symptoms.—The patient has usually had children before, but the last some years previously. She misses one or two periods, which then return as irregular bleeding. At the same time occurs violent stabbing pain in the lower abdomen, severe enough to make her faint, and when she recovers consciousness, she is nauseated. The pain recurs in paroxysms, increasing in frequency and severity, but the interval between them is free from pain. Finally after one of these attacks of pain, the symptoms of internal hemorrhage appear. Frequently, however, this entire history may be negative, and the first symptom is a violent attack of pain with the signs of internal hemorrhage. There is often a discharge of decidua from the uterus, described by the patient as "a piece of flesh, different from a blood-clot," but no ovum is discharged, except in the rare instances when there is a combined intra-uterine and extra-uterine pregnancy. There is a slight elevation of temperature, averaging 99.5°F. and a leukocytosis of 12,000–14,000.

On vaginal examination the patient presents confirmatory signs of pregnancy, the uterus not so large as one would expect to find it, and behind it, or to one side, a pelvic mass, extremely sensitive to the touch. The average time of rupture or tubal abortion is from the eighth to twelfth week of pregnancy.

Diagnosis and Differential Diagnosis.—The diagnosis between the different varieties of extra-uterine pregnancy is made by operation, as the clinical history and symptoms of the tubal, ovarian and abdominal varieties are practically identical. The differential diagnosis from conditions closely resembling it may be of extreme difficulty. Two conditions that are practically indistinguishable from it are (1) hem-

orrhage from a ruptured varicose vein in the broad ligament and (2) severe hemorrhage from the wall of a ruptured Graafian follicle.

Others in which a mistake is excusable are (3) acute salpingitis with or without coincident intra-uterine pregnancy; (4) ovarian cyst twisted on its pedicle; (5) appendicitis with or without coincident intra-uterine pregnancy.

In salpingitis there should be a leukorrheal discharge; higher fever; higher leukocyte count; no decidua passed; less sensitive mass; often bilateral.

The twisted ovarian cyst would be spherical in shape; lower temperature (shock); lower leukocyte count, no decidua. In appendicitis the point of tenderness would be over McBurney's point; higher fever, higher leukocyte count, no decidua; absence of a pelvic mass.

The diagnosis is not so clear in practice. *Acetonuria*, said to be pathognomonic of internal hemorrhage, has proven of no value as a diagnostic aid, as it is found very often in cases of pyosalpinx. In all cases in which a diagnosis of extra-uterine pregnancy is justifiable, the diagnosis should be made and acted upon. All the above require abdominal operation, and the only mistake is that of a possibly unnecessary hurried operation.

A common but unjustifiable error in diagnosis is to mistake extra-uterine pregnancy for an *incomplete abortion.* In incomplete abortion, the cervix would be dilated; chorion would be found in the material discharged from the uterus; the visible bleeding would be considerably greater; shock is less; no palpable pelvic mass and little if any tenderness in the vaginal fornix.

In cases of abdominal pregnancy, past the sixth month of development, the *x*-ray will often afford a means of clearing up the diagnosis between extra-uterine pregnancy and other abdominal tumors as the shadow of the fetal skeleton can be seen.

Treatment is abdominal section as soon as the diagnosis is made. The vaginal route is not advisable. After as complete a preparation as possible under the circumstances, the abdomen

is opened in the middle line, under general or local anesthesia. When the peritoneum is reached, its color is dark slate, if the tube is ruptured, from the clotted blood underneath. When the peritoneum is opened, the blood gushes forth in large quantity. No attention should be paid to it. The affected tube and ovary should be brought up into the wound, ligated and removed. The blood-clots are removed from the abdomen best by irrigation with sterile water or salt solution. The abdomen is closed without drainage. Rapidity of operation is essential. The need for rapidity is over, however, as soon as the blood-supply of the affected tube has been controlled. Any intravenous stimulation or transfusion can be done on the table, during the operation. The expectant plan of treatment, of waiting until the patient has recovered from shock before operation, is not to be recommended. Occasionally these patients will not rally from shock but will bleed to death, and nothing is gained by delayed operation.

When the pregnancy has progressed, as it occasionally does, to the latter months, the danger of rupture is small and the operator is justified in waiting till the child is viable. If the child is alive, in these cases, often extreme difficulty will be found in controlling the bleeding from the placental site, and packing will usually be required. In cases where the child is dead and has been long retained, the placenta, blood-clots and decidua are very putrescible, and drainage is uniformly required. When the tube has ruptured into the layers of the broad ligament, and the patient has recovered from the immediate shock, the resulting hematoma is best evacuated by incision through the vaginal vault.

Active stimulation is the rule in all bad cases. Salt solution intravenously (2500 mil or more) is required. The common mistake is in giving too little. Intravenous transfusion of blood (500–750 mil by Kempton tube or by sodium citrate method): digalen ♏x or digipuratum 1 ampule every three hours hypodermically: strychnin sulph. grain $\frac{1}{20}$ every three hours hypodermically; oxygen for a few hours if very

desperate; and external heat with bandaged extremities. These patients must be well covered both on the operating table and afterward and surrounded by hot water bags, as they are very subject to postoperative pneumonia.

Prognosis.—Without operation 66 per cent. succumb to internal hemorrhage. Of the remaining 34 per cent. a large proportion are invalids or ultimately lose their lives from complications directly a result of the extra-uterine pregnancy (suppurating pelvic hematoma, etc.). With abdominal section, the mortality should be very small (1 per cent. or less), if seen in time, and few, if any, cases are too desperate for operation. A few cases will first rally and then die of acute anemia, in spite of stimulation. Postoperative pneumonia is a common and dangerous complication.

Pregnancy in one horn of a uterus unicornis or bicornis, sometimes occurs. It cannot usually be diagnosed from tubal pregnancy and its complications and treatment are the same. It will probably rupture at the cornu of the uterus, but later in pregnancy than the tubal variety. The ovum may, however, be expelled through the cervix, as in ordinary abortion.

A true cornual pregnancy may either rupture at the third or fourth month, or more likely spontaneously move into the uterine cavity and continue to term.

Metrorrhagia after operation for ectopic pregnancy is due to hypertrophied angiomatous decidua. When it occurs, any time spent in palliative measures is wasted. Dilatation and curetment is the only cure.

Removal of both tubes, with the idea of preventing a second ectopic, is not justified, unless the other tube shows marked evidence of inflammation. At least 33 per cent. of all cases have normal intrauterine pregnancies later, while less than 15 per cent. have a repeated ectopic.

IV. HEMATOSALPINX

Hematosalpinx is a collection of blood in the closed tube.

Causes.—(1) Extrauterine pregnancy; (2) acute tubal conges-

tion; (3) acute tubal inflammation (gonorrheal); (4) associated with gynatresia; (5) tubal menstruation.

The form associated with gynatresia differs from the others in being liable to cause fulminant infection of the peritoneum if it ruptures.

Symptoms are those of salpingitis. The **diagnosis** of the true condition is made on inspection, as the mass palpable by vaginal examination differs little if at all from the ordinary pyosalpinx.

Treatment is abdominal section, with removal of the tube affected.

V. HYDROSALPINX (HYDROPS TUBÆ; SACROSALPINX SEROSA)

This is a collection of serum or thin mucus in the closed tube.

Pathology.—The tube is markedly distended, the walls very thin and almost transparent; perisalpingitis is present, and the cause of the closed abdominal end of the tube, but no inflammatory condition of the tube itself need be present. The mucosa has almost or quite disappeared. Rarely the tubal walls are thickened by inflammation. The condition is usually bilateral and is a sequel of gonorrheal or puerperal infection. The tubes are moderate in size, because the thin walls permit a certain amount of leakage, when the tension becomes great.

Varieties.—(1) Simple hydrosalpinx; (2) pseudofollicular, where the atrophied mucosa suggests gland spaces; (3) hydrops tubæ profluens; (4) tubo-ovarian cyst.

Symptoms.—All give symptoms of moderate pelvic inflammation, but the tenderness on palpation is much less than in salpingitis. Hydrops tubæ profluens or recurrent hydrosalpinx is the name given to the variety which periodically empties itself through the uterine cavity, as evidenced by increasing discomfort, a gush of fluid from the vagina, and then relief from discomfort until the sac has refilled.

Diagnosis.—Bimanual examination shows a fixed uterus and a palpable pelvic mass behind it. The diagnosis will

usually be salpingitis, though the true condition may be suspected by the lack of great tenderness. Hydrops tubæ profluens, due to the periodic gushes of fluid, is sufficiently obvious to avoid a mistaken diagnosis.

Treatment.—Abdominal section, removing the tubes but conserving ovarian tissue where possible.

VI. SALPINGITIS

Salpingitis, or inflammation of the Fallopian tubes is of two kinds: (1) Non-infectious; (2) infectious, the latter being much the commoner.

The non-infectious variety is due to cold, injuries or the escape into the tubes of such fluids as iodin, nitrate of silver or other solutions used in local application to the uterine cavity. It is of short duration, marked by a few days of acute pain from pelvic peritonitis, and relieved by palliative treatment.

Bacteria in infectious salpingitis are: (1) Gonococcus; (2) streptococcus; (3) tubercle bacillus; (4) Bacillus coli communis; (5) staphylococcus. This is approximately their order of frequency. Most pathogenic bacteria can be the cause of salpingitis, but the five given account for the vast majority of cases.

Gonococci, responsible for more than any other organism, pass the barrier of the internal ȯs usually just after a menstrual period. This may not occur for months or years after the original infection. They do very little harm to the endometrium of the uterine body, but find productive soil for growth in the tubal mucosa.

Streptococci are introduced after labor, miscarriage or dirty instrumentation, and very rarely by hematogenous infection from acute foci in other parts of the body (notably the tonsils).

Stages.—Every case of salpingitis, except possibly the tubercular passes through two stages: (1) acute; (2) chronic.

Pathology.—(1) *Acute Stage.* (1) The mucosa is swollen, red and edematous; (2) the mucosa and fimbria are bathed

in a purulent exudate; (3) the tube is elongated, thickened and stiff; (4) the abdominal end is open and there is free exit for pus into the peritoneal cavity; (5) there is marked round-cell infiltration of both mucosa and tubal wall. This is the stage of purulent salpingitis.

(2) *Chronic Stage.*—(1) The tube cell is markedly thickened; (2) the abdominal ostium is closed; (3) the tubal lumen is distended by pus, this being most marked in the outer two-thirds of the tube; (4) the uterine end is closed off and the

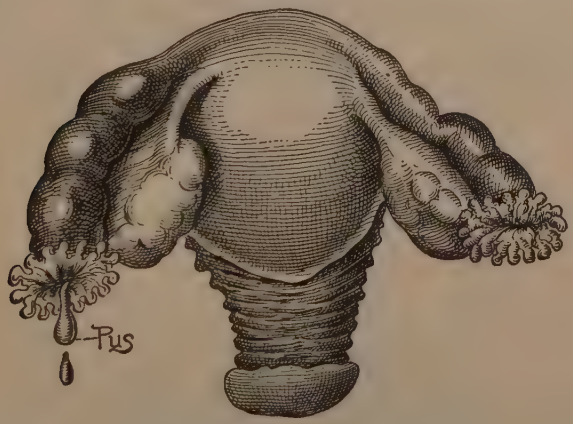

FIG. 65.—Acute double purulent salpingitis. The ampullæ of both tubes are open and dripping pus. (*After Graves.*)

tube becomes a closed sac, which may grow to very considerable size; (5) the epithelial layer loses many of its folds as all of its cilia, and the remaining folds adhere to each other; (6) the tube is elongated, convoluted, and bound down by dense adhesions to the posterior layer of the broad ligament and posterior uterine wall; (7) local hypertrophy is seen anywhere in the course of the tube, but most commonly as a marked elevation at the uterine cornu—*salpingitis isthmica nodosa;* (8) the blood-vessel walls in the muscular coat show hyaline degeneration. This is the stage of *pyosalpinx* or *pus-tube.* Not infrequently the fimbriated extremity is closed

by adhesion to the ovary, over the site of a Graafian follicle. This follicle ruptures and pus from the tube invades the ovarian

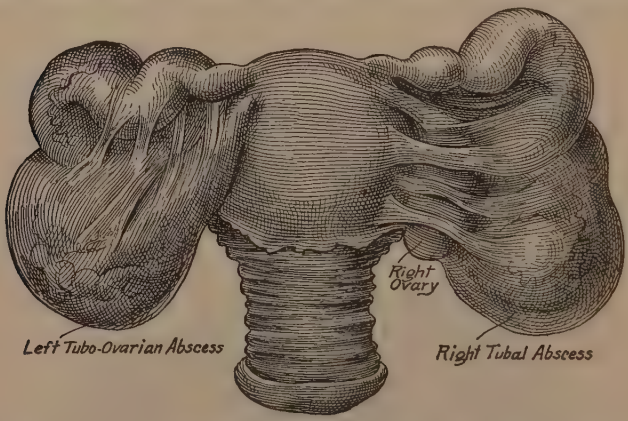

FIG. 66.—The type of adhesions found in double gonorrheal pyosalpinx. (*After Graves.*)

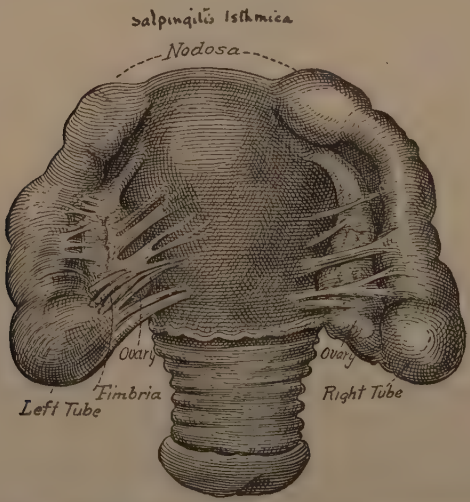

FIG. 67.—Salpingitis isthmica nodosa: a type of bilateral gonorrheal pyosalpinx. (*After Graves.*)

substance. Gradually the whole ovary is invaded and con-

verted into a pus-sac continuous with the tube. Even if both ovaries are involved, the ovarian tissue is never wholly destroyed, as menstruation does not cease. The ovary is permanently damaged, however, and usually must be removed at operation with the offending tube. This is a *tubo-ovarian abscess.*

How the Ends of the Tube are Closed.—(1) By adhesion and retraction of the fimbria, probably the commonest way; (2) by adhesions in Douglas' pouch around the fimbria, which shut off the tubal lumen from the peritoneal cavity, though the lumen itself is open; (3) by adhesions of the fimbria to the surface of the ovary and formation of a tubo-ovarian abscess.

A *pyosalpinx* results only *after* the tube is closed; as long as the tube is open it is called *purulent salpingitis.*

After the tube is closed off, the bacteria contained in the pus gradually die, being destroyed by the compression in the distended tube, and lack of fresh infection from the uterine cavity. The pus becomes sterile usually three or four weeks after the tube is closed, but is liable to fresh infection from the uterine cavity, by ill-advised curetment, or from the bowel, at any time.

Bacteria may be found in the pus in acute cases, when the abdominal ostium is still open. It is useless to look for them in slides made from the pus from the ordinary closed pyosalpinx. This sterility of the pus explains why such a tube can be ruptured at operation with impunity, and the abdomen closed without drainage; a thing never possible in an appendiceal abscess, for instance.

Pelvic peritonitis is always present in acute salpingitis, because the seropurulent discharge from the open abdominal ostium inevitably flows into the peritoneum of Douglas' pouch. This causes the dense adhesions in and following salpingitis. usually spoken of as chronic pelvic inflammatory disease. The older the infection the denser the adhesions; and above all other infections they are densest in syphilis. The adhesions involve the bladder, pelvic organs, intestines, and in severe

cases the whole pelvis is filled with a conglomerate mass of the organs affected. These are the most serious cases, due to the danger of bowel injury and intestinal obstruction.

Symptoms differ markedly in the acute and chronic stages. The symptoms of chronic pyosalpinx and tubo-ovarian abscess are identical.

Symptoms of the Acute Stage.—(1) Acute abdominal pain, most marked in the lower abdomen; (2) rigidity of the abdom-

FIG. 68.—Double gonorrheal salpingitis, showing the extent of adhesions usually met with. It is these adhesions and the necessary trauma in separating them that is responsible for the danger in these operations. (*After Graves.*)

inal muscles, much greater in the lower than the upper portion; (3) great increase of pain on any muscular exertion, or any jolt or jar, such as sneezing, coughing etc.; (4) temperature elevated, the average being about 102, except in streptococcic infection, where it is much higher; (5) leukocytosis 18,000 to 20,000; (6) leukorrheal discharge.

Bimanual examination shows a uterus fixed and immovable; (2) excessive pain on touching either vaginal vault; (3) rarely

in the acute stage a palpable mass for two reasons: (1) The abdominal end of the tube is still open and the tube is moderate in size and (2) the excessive tenderness prevents any deep examination. The acute pain in these cases is due to leakage of pus from the open abdominal end of the tube into the peritoneum of Douglas' pouch, and a sharp pelvic peritonitis. These attacks of pain recur at intervals until the tube is closed and no further leakage is possible.

Differential diagnosis must be made from extra-uterine pregnancy, acute appendicitis and ovarian cyst twisted on its pedicle. Accurate diagnosis is a matter of importance, because it is highly desirable to avoid abdominal section in the acute stage of salpingitis, due to the risk of diffuse peritonitis.

Extra-uterine Pregnancy.—(1) Cessation of menses and then irregular bleeding; (2) violent pain, paroxysmal, with evidence of shock; (3) discharge of decidua and usually absence of leukorrhea; (4) temperature only 99.5 to 100; (5) leukocytosis rarely over 14,000; (6) confirmatory signs of pregnancy.

Acute Appendicitis.—(1) Pain higher up; (2) temperature and leukocyte count about the same; (3) no vaginal tenderness; (4) uterus not fixed; (5) no palpable mass; (6) absence of leukorrhea.

Ovarian Cyst Twisted on its Pedicle.—(1) Severe shock; (2) absence of fever, leukocytosis and leukorrhea; (3) uterus displaced forward and to one side by a globular mass filling the pelvis. The diagnosis is often one of extreme difficulty, if not impossibility, and immediate operation will often be decided upon, based upon a mistaken diagnosis.

Positive smears for gonococci, the gonorrheal stigmata, and positive complement fixation test are strong arguments in favor of salpingitis and against the other possibilities.

Symptoms of the Chronic Stage.—(1) History of leukorrheal discharge, usually of long standing; (2) history of repeated attacks of sharp pain, recurring at intervals; (3) present history of constant dragging pain in lower abdomen; (4) pain invariably increased by the premenstrual congestion, relieved

by the flow, and returning when the flow ceases; (5) menorrhagia; (6) pain increased by any muscular exertion, coitus, or defecation; (7) usually secondary anemia, due to toxemia; (8) pain is often referred to distant regions, as headache, backache or in the nape of the neck; (9) nearly always a history of neurasthenia, digestive disturbances and chronic constipation, due to the pelvic disease; (10) rarely, even extensively inflamed and adherent tubes may give rise to very little local disturbance and present practically no symptoms. Usually, however, patients with chronic salpingitis look prematurely aged, anxious and worn.

Diagnosis.—Abdominal palpation shows marked tenderness to deep pressure over the lower abdomen, but rarely a palpable mass.

Bimanual Examination.—(1) The uterus is fixed and immovable, and almost always shows some backward displacement; (2) there is a hard, irregular, sensitive mass filling Douglas' pouch, in which it may be possible to outline the tubes, ovaries and posterior uterine wall; (3) rarely the tubal mass lies in front of the uterus; (4) pressure on the tubes always causes considerable pain and is often agonizing; (5) the cervix is usually eroded and there is profuse leukorrheal discharge.

Differential Diagnosis.—(1) Retroversion of the uterus may be excluded by the irregularity of the mass filling Douglas' pouch and by the symptoms given above for chronic salpingitis. (2) An old pus tube, densely adherent in Douglas' pouch and to the back wall of the uterus, is often so hard and unyielding as to be mistaken for a subperitoneal fibroid, or for a retroverted uterus. (3) In gonorrheal cases, the complement-fixation test is of value, as a differential point, but is negative until at least four weeks after the onset of gonorrhea. (4) Other possibilities are as given under acute salpingitis. (5) A pus tube may rupture and cause diffuse peritonitis, but this is so rare that the presence of acute, diffuse peritonitis points strongly toward the appendix as origin of the infection.

(6) Diverticulitis of the sigmoid is almost impossible to diagnose from left-sided salpingitis. It usually occurs in women beyond the age at which salpingitis is likely, but in other respects is indistinguishable.

DIFFERENTIAL DIAGNOSIS BETWEEN GONORRHEAL AND STREPTOCOCCIC PYOSALPINX

Gonorrhea	*Streptococcic Infection*
(1) Can occur at any time.	(1) Rare except after miscarriage or labor.
(2) Often bilateral.	(2) Most often unilateral.
(3) Cornual abscess rare.	(3) Cornual abscess common.
(4) Abdominal end of the tube closed.	(4) Abdominal end of tube open.
(5) Tube lengthened, convoluted and adherent.	(5) Tube thick friable, beefy and dark red.
(6) Broad ligament rarely thickened.	(6) Broad ligament always thickened.
(7) Infection travels to tube under mucosa.	(7) Infection travels to tube through lymphatics of broad ligament.
(8) Ovary affected secondarily.	(8) Ovary affected primarily.
(9) Temperature 101–102.	(9) Temperature 104–105.
(10) Leukocytosis 18,000 plus.	(10) Leukocytosis 25,000 plus.
(11) Rarely a palpable abdominal mass.	(11) Usually a palpable abdominal mass, due to omentum adherent to the cornu.
(12) Gonorrheal stigmata (Skene's and Bartholin's glands) present.	(12) Gonorrheal stigmata absent.
(13) Complement-fixation test positive.	(13) Complement-fixation test negative.
(14) Gonococci in discharge.	(14) Streptococci in discharge.

Treatment of Salpingitis

1. **Acute Stage, Palliative Treatment.**—Acute salpingitis, except the streptococcic form, is rarely fatal, the peritonitis is limited to that portion of the pelvis where absorption is slowest, and the disease tends to subside either partially

or completely in six to ten days. The treatment, therefore, is expectant.

(1) Rest in bed; (2) liquid or soft diet; (3) four hot vaginal douches a day, using normal saline solution, as hot as the patient can bear them; (4) ice-bag constantly to lower abdomen; (5) bowels kept well open (best by magnesium citrate solution *flat*, oz. 4 twice daily) (6) for the minority of patients to whom heat is more grateful than the ice-bag, a hot flaxseed poultice to lower abdomen, or hot water bag constantly; (7) no local vaginal treatment such as tampons or applications (other than the douches mentioned above); (8) leukocyte count daily; (9) above all, no curettage or other intra-uterine applications.

This treatment will usually cause temperature, pulse and leukocyte count to drop normal inside of three to seven days, and all pain to disappear. Should the leukocyte count steadily rise, or should a differential diagnosis between salpingitis and extra-uterine pregnancy be impossible, prompt operation is the safest course, though there is some danger of diffuse peritonitis and the case will probably require drainage. If there is a bulging mass in Douglas' pouch, vaginal puncture is the proper procedure; otherwise abdominal section is necessary.

Palliative treatment, in the chronic stage is usually a waste of time. Except in cases of acute exacerbation of a chronic process, which are treated as the acute form, not much if anything can be gained. If the patient's complaint is pain and there is no palpable mass, palliative treatment is desirable; if a mass is present, nothing permanent can be expected from it. (1) Rest in bed during menstrual periods, and avoidance of physical exertion at other times; (2) avoidance of coitus or any other cause of pelvic congestion; (3) hot vaginal douching three times daily; (4) application of 5 per cent. iodin to vaginal vaults three times a week; (5) boroglycerid or ichthyol tampons, renewed three times a week (see chapter on office treatment); (6) no curetment, unless it is to be followed immediately by abdominal section.

OPERATIVE TREATMENT OF ACUTE AND CHRONIC SALPINGITIS

Indications.—(1) Where a large tubal mass is palpable; (2) when palliative treatment has failed to give relief; (3) in cases with great pain, unrelieved by treatment; (4) in working women, who cannot afford the time required for palliative treatment; (5) in acute cases, where there are signs of diffuse peritonitis, or a pelvic mass develops.

Operations.—(1) *Breaking of adhesions*, without removal of any of the pelvic organs; (2) *salpingectomy*—removal of the tube alone; (3) *salpingo-oöphorectomy*—removal of both tube and ovary; (4) *salpingostomy*—reopening a closed tube, in sterility; (5) *hysterectomy*, with removal of both tubes and ovaries as well; (6) *vaginal section*, with breaking up of adhesions, or drainage of an abscess or of the tubes themselves. As it is not possible, before operation, to judge how much must be removed, it is always wisest to obtain written consent of both the patient and her husband, or some other responsible member of the family, to do whatever in the surgeon's judgment seems necessary.

(1) **Breaking up of adhesions,** may be done either by the vaginal route (undesirable) or by abdominal section. It is indicated only when there is no gross change in the tubes themselves, and the tubes are simply bound down by adhesions. The tubes are rolled out of the bed of adhesions holding them, by pressure from below upward and behind forward. This minimizes the danger of injury to the bowel. The prospect of permanent success is not brilliant. In the majority of cases, the adhesions promptly reform.

(2) **Salpingectomy**—removal of the tube alone, by abdominal section.

Technic.—1. The tube is freed from adhesions and delivered through the wound.

2. It is grasped with one hemostat at the cornu of the uterus and by another just below the fimbriated extremity, above the ovary.

3. The tube is cut loose from the cornu by a wedge-shaped excision of the uterine muscle.

4. It is cut loose from the mesosalpinx, each vessel being clamped as it is cut; four or five hemostats are needed.

5. With a number 1 chromic catgut stitch, soaked in water so as to be pliable, the cornu and upper edge of the broad ligament are sewed over, taking a half hitch at each stitch. A simple running stitch is not hemostatic. This stitch is tied at the cornu, where it begins, and again outside the outer hemostat.

6. One or two small mattress stitches, to secure bleeding points may be required.

This has the great advantage over other methods that it does not distort the broad ligament, and that slipping of the ligature, provided the catgut is pliable, is hardly possible. The method is not possible if the broad ligament is infiltrated and stiff.

Alternative Method.—(1) A ligature of number 3 chromic catgut is passed through the broad ligament under the round ligament; (2) the tube is cut loose from the cornu; (3) the first ligature is tied under the excised end of the tube; (4) a second ligature is placed near the first and tied down, across the whole mesosalpinx, just above the ovary; (5) the tube is cut off; (6) the cornual wound is closed.

The outer ligature in this method is prone to slip, especially if the mesosalpinx is stiff.

The tube may be removed by anterior vaginal section, under the bladder, delivering the uterus out under the bladder and then the tube removed by either of the methods described above. The small amount of working space and the difficulty in dealing with adhesions make the method undesirable.

(3) **Salpingo-oöphorectomy**—removal of tube and ovary, is indicated when the ovary is badly damaged, or forms part of the wall of an abscess.

Technic.—(1) The tube and ovary are freed from their bed and delivered in the wound; (2) the tube is grasped at the cornu with a hemostat; (3) a second hemostat grasps the free ovarian

edge of the broad ligament; (4) the tube is excised at the cornu and tube and ovary are removed together by cutting across the upper edge of the broad ligament, clamping vessels as they are cut; (5) the cornu and broad ligament wounds are closed by a running lock stitch (half stitch) of number 1 chromic catgut, *pliable*, as in salpingectomy.

This is the ideal method, but is not always possible because for it the broad ligament must be free from infiltration.

Alternative Method.—(1) The tube and ovary are freed as before; (2) a ligature of number 3 chromic catgut is passed through the broad ligament, under the round ligament, close

FIG. 69.—The condition often found at operation for gonorrheal pyosalpinx. The bowel is extensively involved in dense adhesions. (*After Crossen.*)

to the uterus; (3) the tube is excised at the cornu and the ligature tied under the excised end. This secures the uterine artery; (4) a second ligature is passed through the broad ligament, near the first and tied on the free ovarian edge of the broad ligament; (5) the ovarian artery is tied again, just beyond this ligature, as the free edge of the broad ligament has a strong tendency to slip from the bite of the single ligature. From this edge of the broad ligament come most of the secondary hemorrhages after operation; (6) the ovary and tube are removed; (7) the cornu is closed and with the same stitch,

the cut edge of the broad ligament is whipped over. This is the best method, when the broad ligament is infiltrated.

Vaginal section for salpingo-oöphorectomy is open to the same objection as for salpingectomy.

Conservatism is most desirable in these operations. It is often possible to remove the outer portions of the tubes only, and do an ovarian resection, so as to leave at least part of the adnexa, if they are reasonably free from pathological changes. There is some chance of future trouble necessitating a second operation and this should be explained to the patient before operation, and the choice left with her.

(4) **Hysterectomy** is usually not necessary, unless the uterus itself is greatly diseased. Even if both tubes and ovaries have been sacrificed, the uterus is not a useless organ. It affords marked support for the vaginal vaults, and the two objections to leaving it (leukorrhea and metrorrhagia) can be met by the curetment which should always precede any section for pelvic inflammatory disease, except that due to streptococcic infection. If hysterectomy is required, the technic is exactly that described in the removal of a fibroid tumor (Chapter VII).

In all the operations thus far described, an important step is to pack off, with gauze, the upper abdominal cavity, above the pelvic brim, to prevent contamination if an abscess is opened into. This is desirable in any case; it is absolutely essential in streptococcic cases.

(5) **Salpingostomy** is the reopening of closed tubes, either by dilatation of the fimbriated extremity or by cutting a window in the side of the tube, for the possible relief of sterility.

Technic.—(1) The tube is delivered into the wound; (2) with scissors a small opening is made over the closed fimbriated end; (3) a hemostat is inserted in this opening and the blades opened, to dilate it, this method causing a minimum of trauma, or a window is cut in the side of the tube, in its outer third, and the mucosa united to the serous coat with interrupted sutures.

The results are not satisfactory; only rarely has pregnancy

resulted, and there is considerable risk of extra-uterine pregnancy, rather than intra-uterine.

(6) **Vaginal section and drainage,** while usually undesirable, has a field. In acute cases, with large pelvic mass, or in the profound cachexia seen with large chronic tubes it is decidedly useful.

Technic.—(1) The patient is arranged in the lithotomy position and prepared as for any vaginal operation; (2) the posterior lip of the cervix is caught with a tenaculum and pulled up toward the symphysis; (3) a semicircular incision is made through the vaginal vault, and with a pair of scissors, inserted close to the uterus and in the middle line, the mass is punctured and the scissors withdrawn open; (4) the cavity is explored with the finger, as far as it will reach, and then washed out; (5) the cavity is drained with gauze (if not much pus has escaped) or with a T-drainage tube, and irrigated daily until all discharge has ceased. This method is indicated to relieve the acute septic symptoms and as a preparation for a subsequent abdominal section.

Drainage in abdominal sections is needed in many cases for (1) persistent oozing from the posterior wall of the uterus, broad ligaments and Douglas' pouch or (2) infection. The best method is a glass tube and gauze, through the lower end of the abdominal incision. Drainage into the vagina through the posterior vaginal vault is satisfactory for hemorrhage but not for infection, and especially not for the streptococcic kind. Drainage, its method and after care is described in Chapter X under peritonitis and pelvic abscess. Two classes of patients do not admit of drainage:

(1) Tubercular salpingitis, because drainage means a permanent abdominal fistula.

(2) Syphilis, because around the gauze there is such an exudate of lymph that the whole pelvis is filled by a solid mass and there is great danger of intestinal obstruction.

Sterility after double salpingo-oöphorectomy is almost invariable, though pregnancy may result from the remains of an

ovary left adherent to the broad ligament, the ovum gaining access to the uterine cavity through the uterine cornu, which has not healed tight. Efforts at transplantation of the ovary, from the same or another patient, and sewing it into the cornu have not been successful. In any case the patient should not be told she is sterile, as the mental effect on her is often unfortunate.

The **surgical menopause,** which is the more severe the younger the patient, can be controlled by hypodermic intramuscular injections of corpus luteum extract or whole ovarian extract; 1 mil daily for thirty doses and repeated in series of twelve doses at intervals of several months, if needed.

This method is better and more certain in its results than the implantation in the abdominal wall, next the fascia, of ovarian tissue. If this latter is done, it is important to use only ovarian grafts (slices) and not the whole ovary. The thin grafts are not subject, as is the whole ovary, to cystic degeneration.

Removal of both tubes in cases known to be gonorrheal, where one is obviously infected, is a matter of individual choice. It should be explained to the patient beforehand that the disease is most often bilateral, and that she might need a second operation within one or two years, if the at present inoffensive tube is left, and the choice left with her. The wisest plan is to obtain consent for whatever is necessary in the surgeon's judgment, and be as conservative as possible. If the second tube shows evidence of beginning inflammation, it is better removed; if it is free from all signs, it may be left, but with some misgivings.

Routine curetment of the uterus is the rule in all cases requiring abdominal section for pelvic inflammatory diseases, except the streptococcic cases. The uterus is dilated, curetted and then wiped out with 7 per cent. tincture of iodin or pure carbolic acid. The acid application is followed by one of alcohol to the *vagina* (not uterus) to prevent vaginal burns.

Ligature material in all operations should be number 3

chromic catgut. Silk or any permanent suture material should be avoided as secondary abscesses and abdominal sinus are very common after their use.

Several methods to combine pressure and heat as hemostatics and thus do away with ligatures altogether have been devised. Most notable is the Downs electrothermic angiotribe, but none of these appliances give even reasonable safety from secondary hemorrhage, and they are not to be recommended.

VII. TUBERCULOSIS OF THE FALLOPIAN TUBES

Tuberculosis of the tube is more common than in any other portion of the genital tract. It attacks both the mucosa (endosalpingitis) and the peritoneal covering (perisalpingitis).

Cause.—(1) Hematogenous infection from some distant focus which may be latent, while the tubal process is active. This is the usual, and apparently primary, type. (2) Descending infection from the peritoneum; (3) ascending infection from the external genitalia (exceedingly rare).

Pathology.—(1) Except in general miliary tuberculosis, the condition is always chronic; (2) it is always bilateral; (3) the mucosa and tube wall are infiltrated with round cells, among which are many typical tubercles, with giant and epithelioid cells; (4) the abdominal end closes early, so that pyosalpinx promptly develops; (5) the peritoneal coat is studded with hard yellowish tubercles, like millet seed; (6) the contents of the tube are white, cheesy pus if the process is purely tubercular; or creamy yellow pus if it is a mixed infection (as is common); (7) tubercle bacilli can be demonstrated in section of the tube wall. (8) The adhesions of tubercular pus tubes are often very dense, and sometimes absolutely inoperable—in contrast to gonorrhea, which are rarely so. (9) Tuberculosis of the tube can exist in fetal life.

Symptoms are like those of any other salpingitis. Tubercular salpingitis is fairly common in young girls, so that an inflammatory pelvic mass, in a patient with intact hymen, may safely be diagnosed as tubercular.

Progress is slow and insidious. If it appears in youth, it is associated with general under-development. Amenorrhea is common, and sterility is inevitable.

Treatment.—Abdominal section with removal of both tubes and such other portion of the genital organs as show marked involvement. Drainage of the abdomen is contra-indicated. At operation the mass of adhesions may be inextricable, and the case abandoned as inoperable. In such cases the simple opening of the abdomen and admission of air may, as in tubercular peritonitis, effect extraordinary cures, by spontaneous absorption and disappearance of the adhesions.

Operation is contra-indicated, if there are remote active lesions threatening the patient's life, or in acute general miliary tuberculosis.

VIII. TUMORS OF THE FALLOPIAN TUBES

Tumors are rare. They are either *benign* or *malignant.* The benign growths are fibroma, fibromyoma or adenomyoma; they are small, usually in the inner one-third of the tube, give no symptoms and are usually accidentally found at operation. Malignant growths are carcinoma, sarcoma, chorion-epithelioma and endothelioma.

Primary carcinoma of the tube occurs most often after the menopause, between fifty and sixty. It is originally in the mucous membrane and is supposed to be caused by pre-existing inflammation. It is a papillary growth, and is usually in the outer third of the tube.

It is also secondary to cancer of the uterus (fundus) or general abdominal carcinomatosis.

Symptoms are those of the pelvic inflammation which accompany it. The true diagnosis is made at operation. In doubtful cases a small piece is excised and a rapid diagnosis made by the freezing microtome.

Treatment is abdominal panhysterectomy.

Recurrence is common, due to abdominal adhesions.

Cysts of Morgagni—small pedunculated cysts hanging from

the fimbriated extremity of the tube, have no clinical or pathological significance. They are limited in size.

IX. VARICOCELE OF THE PAMPINIFORM PLEXUS

This is very common, being associated with any chronic congestion of the genital organs. It is more common on the left side, and the discomfort is more marked, due to the left ovarian vein emptying into the renal at a right angle, without a valve.

FIG. 70.—Varicocele of the pampiniform plexus and the placing of the first ligature. (*After B. C. Hirst.*)

Symptoms.—(1) Heavy, dull aching pain in the groin, usually the left, worse on standing, worse at the periods, and relieved by lying down. It is aggravated by exertion. The symptoms are not distinctive and a definite diagnosis cannot be made by vaginal examination. The condition is usually found coincident with other pelvic disease.

Treatment.—(1) Remove any cause of uterine congestion which can be found. (2) Pituitrin ½ mil hypodermically every day for ten doses. (3) If the veins are found, at operation, to be distended, ligature and excision is the only cure.

CHAPTER IX

DISEASES OF THE OVARY

GENERAL ANATOMY AND RELATIONS OF THE OVARY

The ovary secretes ovules during the period of the woman's sexual activity, from the fifteenth to the forty-fifth year, on the average. It is an elliptical gland, 5 cm. long, 3 cm. broad and ½ cm. thick and weighs about 8 grams. It lies against the posterior border of the broad ligament, in a depression on the lateral pelvic wall (*the ovarian fossa*), to which it is attached by a reduplication of the peritoneum of the broad ligament—the *mesovarium*—containing the blood-vessels, nerves and lymphatics. The ovary is the only structure projecting into the peritoneum which has no peritoneal covering.

Ligaments.—From the uterine pole of the ovary runs the utero-ovarian ligament; from the tubal pole runs the infundibulopelvic ligament (a thin band of connective tissue in the upper margin of the broad ligament). To the tubal pole is attached the ovarian fimbria.

Arteries are branches of the ovarian artery and ovarian branch of the uterine artery. They enter the ovary at the hilus.

The **veins** leave the ovary at the hilus. They empty into the pampiniform plexus, which in turn leaves the broad ligament as the ovarian vein. This empties into the renal on the left; into the inferior vena cava on the right.

The **lymphatics** leave the ovary with the veins and empty into the deep lumbar glands.

The **nerves** are derived from the plexus surrounding the ovarian artery. They are sensory and vasomotor.

Histologic divisions are (1) the *hilus*—where the mesovarium is attached and where the vessels enter and leave the ovary;

(2) the *oöphoron*—the egg-secreting portion, containing the Graafian follicles; (3) the *paroöphoron*—containing the microscopical remains of the Wolffian body; (4) the *parovarium* (epoöphoron)—in the mesovarium, consisting of six to twelve small ducts, like the teeth of a comb, emptying into a common duct (Gärtner's duct) representing the back of the comb. Gärtner's duct runs parallel with the tube, and usually ends in a blind pouch in the broad ligament. Occasionally it can be traced through the broad ligament, uterine wall, vaginal vault

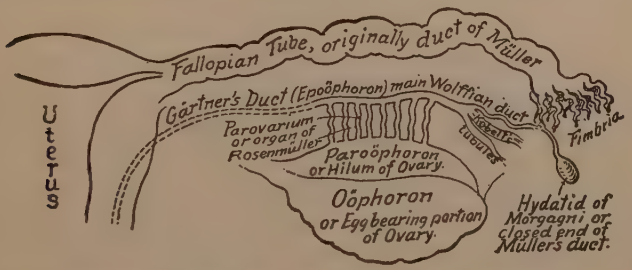
Fallopian Tube, originally duct of Müller
Gärtner's Duct (Epoöphoron) main Wolffian duct
Uterus
Parovarium or organ of Rosenmüller
Paroöphoron or Hilum of Ovary.
Tubules
Fimbria
Oöphoron or Egg bearing portion of Ovary
Hydatid of Morgagni, or closed end of Müller's duct.

FIG. 71.—Diagram of the tube, ovary and broad ligament, and their structure. (*After Stewart.*)

and down the anterior vaginal wall as far as the vulvar orifice.

Development of the Ovary.—The ovary is developed about the sixth week of fetal life, the genital glands appearing to the median side of Müller's ducts and the Wolffian body. The germinal epithelial cells permeating the ovary are cut off and confined in connective tissue spaces.

A primordial follicle is one of these connective-tissue spaces surrounded by a wreath of capillaries and contains a highly specialized cell—the ovum.

Descent of the ovary takes place at the third month of fetal life, being drawn down by the gubernaculum of Hunter. This gubernaculum fuses in its upper portion with the Müllerian ducts at their point of union—at the fundus uteri, and finally remains as the ovarian and round ligaments.

Graafian Follicles.—The chief function of the ovary is the

development and ripening of Graafian follicles and the discharge of ova. At birth each ovary contains about 30,000 primordial follicles, and no new ones are created after birth. The follicles are all contained in the oöphoron or parenchymatous layer of the ovary.

There are three stages in the maturing of the follicle: (1) The primordial; (2) the ripening and (3) the mature follicle. The primordial follicle lies embedded in the ovarian stroma, and consists of the ovum surrounded by a single layer of low flat epithelium. When the follicle begins to ripen, the epithelial cells surrounding it multiply into several layers, and lie closely around the ovum. In the mass of cells appears a clear space, which becomes filled with fluid—the *liquor folliculi*, and partly surrounds the ovum. The ovum is still surrounded by several layers of epithelial cells, which project into the clear space like a peninsula. These cells form the *discus proligerus*, and the rest of the epithelium, around the follicle, is called the *membrana granulosa*. At the same time the *outside* of the follicle is being surrounded by an envelope of connective tissue, the theca folliculi, which has two layers, an external and internal. The ovum itself is now surrounded by a capsule—the *zona pellucida*, which contains fluid, so that the ovum is not in direct contact with its capsule. The ovum is nourished through this fluid and the liquor folliculi. As the follicle ripens, it at first retreats into the ovary, but later, when fully ripe and distended with liquor folliculi, it again approaches the surface and bulges out on it. At a point opposite the ovum there appears a pale translucent spot—the *stigma*, and through this the follicle ruptures and discharges its contents. The ovum is carried into the tubal canal by the current set up by the ciliated epithelium, or it may be discharged directly into the ampulla.

Ovulation should normally occur a few days before or synchronously with menstruation. This rule is by no means constant and practically the two processes can occur independently.

The *corpus luteum* begins to be formed as soon as the ovum is discharged. The empty follicle fills with blood. The yellow wrinkled membrane surrounding the central blood mass is derived from hypertrophied cells of the membrana granulosa—now called lutein cells—and is of connective tissue origin. This layer contains connective tissue and blood-vessels. The regression of the corpus luteum takes about four weeks, except for that of pregnancy, which lasts seventy-five to one hundred and twenty days. The yellow coloring matter is absorbed, and by hyaline degeneration and shrinking the *corpus albicans* is formed. This white body persists for a long time, but finally disappears completely, leaving only a small indentation on the surface of the ovary.

As only a small proportion of follicles ever develop and mature, the others are absorbed by "atresia of the follicle."

Ovarian Internal Secretion.—The exact nature and its source are not known. Part comes from the follicle apparatus, which presumably controls the growth and development of the genitalia; part from the corpus luteum and probably controls menstruation and prepares the endometrium for the reception of the fertilized ovum. Part comes possibly from the interstitial portion of the gland, though this is as yet entirely theoretical.

Atrophy of the ovary is permanent after the menopause, and to a certain extent temporary during lactation.

Absence of the ovary is seen only in absence of the entire genital system, or in unilateral development of the uterus—uterus unicornis.

Accessory ovary is rare; it is not known whether it is a diverticulum from the normal ovary or an independent gland.

ABNORMALITIES AND DISEASES

I. Cirrhosis of the Ovary

Cirrhosis of the ovary is physiologic at the menopause, the ovary becoming much smaller, harder and wrinkled. It is occasionally seen during menstrual life, involving only a

part of the ovary as a rule, but at times the whole gland. It is common in single women, past the age of thirty-five. Its only symptom is *dysmenorrhea* persisting in spite of dilatation of the cervical canal. It may require abdominal section, if the pain is severe enough to demand relief, with resection or removal of the ovary. Medical treatment, either general or by local application, is useless.

II. Congestion of the Ovary

Congestion of the ovary is physiological at each menstrual period, during coitus and in pregnancy. At other times it is secondary to retrodisplacement of the uterus, coitus interruptus or any other cause of general pelvic congestion. A consequence of prolonged congestion is chronic parenchymatous hypertrophy with multiple cysts.

Ordinarily the condition is promptly relieved by the correction of its cause.

III. Cysts of the Ovary

Classification.—Cysts of the ovary are classified according to the histologic division of the ovary from which they spring; or according to their clinical importance.

Histologic Classification.—1. Cysts of the *Oöphoron.*—(1) Simple follicular cysts; (2) multiple follicular (cystic ovary); (3) cysts of corpus luteum; (4) dermoid.

II. Cysts of the *Paroöphoron.*—(1) Cystadenoma or glandular cysts.

III. Cysts of *Parovarium.*—(1) parovarian.

Clinical Classification.—I. Simple or non-proliferating—(1) Simple follicular; (2) cystic ovary; (3) corpus luteum.

II. *Proliferating Cysts.*—(1) Cystadenoma or glandular; (2) parovarian.

III. *Ovigenous.*—(1) Dermoid; (2) teratomata.

IV. *Degenerations.*—(1) Papillary; (2) carcinoma.

Characteristics of Ovarian Cysts.—I. *Follicular* cysts may be either single or multiple. They are frequently a result of chronic interstitial inflammation. They are of slow growth,

of limited size (about that of the fist), have a thin translucent wall and most of them are unilocular. They are intraperitoneal, benign, and have a pedicle. The contained fluid is clear.

II. *Corpus luteum cysts* are limited in size, of slow growth, are intraperitoneal and have a pedicle. The cyst wall on section is yellow, and the contained fluid reddish and turbid. These cysts are especially prone to intracystic bleeding. The

FIG. 72.—Simple follicular cyst of the ovary. (*After B. C. Hirst.*)

bleeding is rarely serious, and is usually completely absorbed. When it is not, it forms the so-called *tarry hematoma of the ovary*, the old blood being black as tar.

The lutein cysts associated with hydatid mole or chorion-epithelioma are called theca-leutin cysts.

III. *Cystadenomata* (glandular cysts; pseudomucin cysts) are of two kinds; (1) pseudomucinous and (2) serous.

The *pseudomucin cysts* are said to be the commonest form of ovarian tumor. They are of unlimited size and usually rapid growth; unilateral; always multilocular; the locules varying widely in size, containing a thick mucoid substance, alkaline in reaction, closely resembling true mucus, but differing in that it does not give the mucin reaction with acetic acid

(hence pseudomucin). The cysts are intraperitoneal, and have a pedicle. The pseudomucin may be of various colors, due to bleeding or local necrosis in the cyst, varying from clear glassy mucus to black.

The locules are lined with high non-ciliated cylindrical epithelium, which secretes the pseudomucin. These cysts rarely undergo papillary or malignant degeneration.

Serous cystadenomata are often bilateral, always multilocular, though the locules are fewer. They are intraperitoneal, have a pedicle and contain a clear yellow serum, rich in albumin, but without pseudomucin. They nearly all show papillary proliferation of the lining epithelium and are very prone to become malignant, and hence often recur after operation as local or general peritoneal carcinomatosis. Both pseudomucin and serous cystadenomata originate from the germinal epithelium, but their cause is not known.

IV. *Parovarian cysts* arise from an abnormal section of the lining epithelium of the longitudinal duct. They are therefore retention cysts and not really proliferating growths. They are unilocular, and contain an opalescent serum. They are of rapid growth, reach a large size, extraperitoneal between the layers of the broad ligament. They rarely have a pedicle. The Fallopian tube is stretched out over the surface of the cyst. The ovary is not destroyed, but is attached to the surface of the tumor. This cyst has two coverings: the peritoneum of the broad ligament and its own wall. The lining epithelium is ciliated. Papillary degeneration is very rare and rarely if ever do they become malignant.

V. *Dermoid cysts* constitute about 10 per cent. of all ovarian tumors. They are of slow growth, limited size (that of the clenched fist) are intraperitoneal and have a pedicle. They are prone to become adherent, and cause more pain than any other cyst of moderate size. They are unilocular and contain all kinds of fetal structures—sebaceous matter, hair, and bone in that order of frequency. No fetal membranes have ever been found.

Dermoids rarely become malignant, though malignant degeneration of their epithelial contents is not rare. They are often associated with pseudomucin cysts, are not infrequently bilateral. They have long pedicles, and are therefore especially prone to twist on their pedicles. Their contents are very putrescible and if ruptured usually cause peritonitis.

Teratomata are the rarest of ovarian growths. They are like dermoids, in the fetal structures present, but are essentially malignant (sarcoma). They grow rapidly, reach large size and give early and free metastasis. Only about fifty cases are on record.

Certain teratomata, containing a preponderance of thyroid tissue, are known by the term "struma ovarii."

There are two theories for the origin of dermoid cysts: (1) Fetal inclusion; (2) parthenogenesis—from imperfect segmentation and development of the true germ cell, or, as has been lately advanced, from a blastomere—separated from the true cell.

The pedicle of an ovarian cyst is composed of the ovarian ligament, the infundibulopelvic ligament, the free edge of the broad ligament, the tube and the utero-ovarian anastomosis of vessels. It is not possible, as a rule to tie off only the mesovarium, which should be the true pedicle. All the above-mentioned structures are included in the ligature.

Rate of growth of cysts is usually considerably more rapid than a solid tumor, such as a fibroid, because being a secreting tumor, it can form fluid faster than a solid tumor can form new cells. Like a fibroid, the presence of ascites usually means malignancy or papillary degeneration.

Symptoms naturally differ, with the type of cyst.

Symptoms of Simple Follicular, Cystic Ovary and Corpus Luteum Cysts.—These depend to a great extent upon the size and weight of the cyst. If uncomplicated, they are often unnoticed, as tension on the ovarian substance by the growing cyst does not cause pain. Very often these cysts are first diagnosed by a vaginal examination made for other reasons. When symptoms are present they are as follows:

(1) Moderate pelvic pain, sometimes that of subacute salpingitis; (2) pressure on bladder and rectum; (3) menstrual irregularity, usually scanty, infrequent flow; (4) sense of weight in pelvis and backache; these usually only when the cyst is adherent.

Diagnosis is made by bimanual examination, when the globular, cystic tumor can be felt, often displacing the uterus to one side and forward.

No diagnosis of ovarian cyst should ever be made, until the bladder is known to be empty.

Symptoms of Glandular Cysts (Adenocystomata).—(1) Rapidly increasing size of the abdomen; (2) menstrual irregularity, usually amenorrhea; (3) emaciation (facies ovariana); (4) irregular resistance of the abdominal wall, on palpation, due to large locules and areas of greater density; (5) if the growth is intraligamentary and papillary, menorrhagia and ascites are usually present; (6) pressure symptoms on bowel and bladder appear early, and are most severe in intraligamentary growths; (7) edema of both legs (a late symptom due to pressure).

Diagnosis of glandular cysts is made by the above symptoms, and by bimanual examination, which shows the uetrus pressed far forward and to one side, and the pelvis blocked by a cystic mass evidently continuous with the abdominal mass.

Differential diagnosis between pseudomucin and serous cystadenomata is made only at operation.

Symptoms of parovarian cysts are the same as the glandular. The rate of growth is slower, they are usually intraligamentary and therefore pressure pain is a more prominent symptom, but clinically the diagnosis is made only at operation.

Symptoms of dermoid cysts are the same as those of the simple cysts, except that pain is a prominent one. They are the commonest ovarian tumors in young subjects, but the actual diagnosis is made at operation. The cyst wall is white, with marked adhesions and often red blotches, in contrast to the smooth shining bluish wall of the simple cyst.

Symptoms of Teratomata.—These are *solid* tumors, with areas of cystic degeneration, reach a large size, grow very rapidly and are associated with ascites.

Differential Diagnosis of Ovarian Cysts.—1. *Pregnancy* may be closely simulated in appearance by an ovarian cyst, but the absence of confirmatory signs of pregnancy by vaginal examination; the absence of fetal movements and heart sounds; the absence of a shadow of the fetal skeleton on an *x*-ray plate; the small hard uterus pushed foward or backward and to one side should make the diagnosis clear.

FIG. 73.—The outline of the abdomen in a case of large ovarian cyst. The outline of an overdistended bladder is very similar. (*After Crossen.*)

2. *Full bladder* may be at once diagnosed by catheterization, a precaution that should always be taken in any case of supposed cystic abdominal tumor.

3. *Fibroid tumor* is hard, nodular, bold in its outlines, usually with a history of menorrhagia; the uterus forms part of the growth and the cervix moves in unison with the abdominal mass. A dense firm intraligamentary cyst cannot be differentiated, as a rule.

4. *Ascites* does not displace the uterus; the contour of the abdomen, unless the fluid is encysted, changes as the patient changes her position; no cystic mass can be felt by vaginal

examination. Encysted ascites may so closely simulate an ovarian cyst as often to be indistinguishable from it.

Abdominal fat can easily be differentiated by bimanual examination; *tympanites* by percussion and bimanual examination. *Tumors of the kidney* are rarely large enough to be mistaken for ovarian cysts; they do not extend low enough to be palpated through the posterior vaginal vault, and they cause bulging in the triangular space of the costovertebral angle, when the patient is erect.

FIG. 74.—Parovarian cyst, showing the great elongation of the Fallopian tube. (*After Graves.*)

Treatment of an ovarian cyst is operative. Palliative treatment is not advisable, because of the ever-present danger of twist on the pedicle. Medical treatment, of course is useless.

Technic of operation for simple, corpus luteum and dermoid cysts:

1. Usual median abdominal incision.

2. The cyst is freed from any adhesions and delivered through the wound. If there is any suspicion that the cyst

is dermoid, it should be delivered unruptured. In the others, rupture of the cyst in delivery makes no difference.

3. The mesovarium is transfixed by a pedicle needle carrying a number 3 chromic catgut ligature, which is then tied down around the pedicle formed by the tense mesovarium, several encircling ties being made.

4. The ligature is guarded by hemostats clamped above it and the cyst removed with scissors.

5. The other ovary is always inspected, as dermoids particularly are often bilateral.

6. The abdomen is closed as usual.

If a dermoid is ruptured during removal, the sebaceous contents must be sponged out of the abdomen with the greatest care. Although they are sterile, they are extraordinarily putrescible and fatal peritonitis may follow neglect of the precaution.

Technic for cystadenomata, or *parovarian cysts with a pedicle:*

1. The abdomen is opened in the usual way, the peritoneum being first opened near the umbilicus, as the bladder is often carried high up.

2. The operator's hand is inserted in the abdomen and all adhesions are freed.

3. As long as the cyst wall is blue in color and free from adhesions, it may be punctured with impunity.

4. The cyst wall is punctured by a large cannula, with rubber tube attached, and the main locule drained into a bucket or basin, at the side of the table.

5. The cyst wall is caught with clamps and pulled out of the wound, as it collapses. In this way a huge cyst may be brought out through a moderate incision.

6. The cannula is removed, as soon as the cyst is delivered and the hole in the cyst closed by a clamp.

7. The pedicle is tied off, including the tube, with number 3 chromic catgut and the cyst removed.

8. The broad raw pedicle is sewed over with number 1 chromic catgut, to minimize the danger of adhesions.

9. The other ovary is inspected. In serous cystadenomata with papillary degeneration, both ovaries are better removed, as recurrence is almost certain if one is left.

10. The uterus is suspended, as otherwise the weight of the pedicle may pull it backward and cause adherent retroversion.

11. The abdomen is closed as usual.

Technic for intraligamentary cysts, without pedicle:

1. Median abdominal incision.

2. If very large, the cyst is tapped as described above. If small, this is unnecessary.

3. The ovarian artery in the outer edge of the broad ligament is tied in two places and cut between.

4. The broad ligament is split across its anterior face.

5. The cyst wall is shelled out (easily, if not adherent) from its bed in the broad ligament. *Close watch must be kept for the ureter, which is often displaced.* It can be peeled off the cyst wall and thus saved from injury.

6. The bed of the cyst is inspected for bleeding vessels, usually very few, which are tied. If there is profuse general oozing (in inflamed adherent cysts only) the cavity of the broad ligament is packed with gauze and the end carried down into the vagina, through an opening in the posterior vault.

7. The cut in the broad ligament is repaired and the abdomen closed as usual.

8. If gauze packing is used, it is removed in forty-eight hours.

Tapping of large cysts, either through the abdominal wall or posterior vaginal vault, is objectionable.

Its fancied advantages are: (1) Reduction in size of the cyst (temporary only, as it rapidly refills), (2) prevention of shock at operation for removal, if done two or three days previously (fallacious).

Objections.—(1) Rapid refilling of the cyst; (2) implantation metastasis; (3) hemorrhage, if a large vein be punctured; (4) infection; (5) adhesions, making subsequent operation more

difficult; (6) danger of puncturing a dermoid, with consequent peritonitis.

Tapping will not cause permanent disappearance of a cyst, as the small puncture closes promptly and the cyst refills. If it is done, the cannula must be of large caliber, as the thick pseudomucin will not run out through a small one.

Marsupialization of a cyst is required when: (1) At operation the cyst wall is too densely adherent for complete removal; (2) in virulently infected cysts. It consists in securing the

FIG. 75.—Ovarian cyst, twisted on its pedicle. The cyst wall is very dark purple, almost black. (*After Graves.*)

fibrous cyst wall to the edges of the abdominal incision, after opening the cyst and dissecting out its secreting glandular layer as far as possible. The cavity is packed with gauze, renewed daily until granulation obliterates it. The method is to be avoided whenever possible, as convalescence is exceedingly prolonged.

Accidents to Cysts.—(1) Twist on the pedicle; (2) rupture; (3) intracystic hemorrhage.

(1) **Twist on the pedicle** is an ever-present danger. The

pedicle of every ovarian cyst, as it grows out of the pelvis, is partly twisted into a spiral, the turn being to the side from which the tumor sprang; right-sided cysts twist to the right, and *vice versa*. As a result of pressure of the intestines, sudden exertion, relaxation of the abdominal walls, or often without obvious cause, the cyst may twist from one to seven complete turns. Moderate size tumors are more likely to twist than large ones, dermoids are especially prone to twist, and the accident is very common after childbirth. As a result of the twist, the circulation is interfered with or entirely cut off, the tumor becomes bluish black. It usually increases in size suddenly, and may rupture. If the blood supply is completely cut off, it becomes gangrenous.

Symptoms.—(1) Sudden severe pain; (2) shock; (3) fever (101–102°); (4) rapid pulse (130–150); (5) intense abdominal tenderness (due to non-infectious peritonitis); (6) if the cyst has ruptured, collapse.

Treatment.—Immediate operation, and removal of the cyst, as described in the treatment of simple cysts. Care should be taken not to rupture the cyst in delivering it, and many light adhesions will be found.

Thrombosis of the pelvic veins in the broad ligament is a frequent complication and influences the prognosis, due to the danger of embolus. Delayed operation is not advisable, as the cyst once twisted stays so, and the patient may at any time become septic.

(2) **Rupture of a Cyst.**—The consequences depend entirely upon the nature of the contents, but as a rule it is not a dangerous accident.

Causes.—(1) Trauma—such as a fall or kick; (2) violent abdominal pressure; (3) pressure in labor; (4) bimanual examination; (5) rapid increase in size; (6) necrosis or degeneration of the cyst wall.

The simple follicular and parovarian cysts are the most likely to rupture.

Symptoms.—In the case of a small follicular cyst there are

usually no symptoms whatever. The cyst, during a bimanual examination, is simply felt to disappear.

The *symptoms* of rupture of a large cyst are: (1) Sudden sharp pain; (2) change in contour of abdomen; (3) moderate shock; (4) rarely symptoms of internal hemorrhage; (5) in dermoids, plastic peritonitis; (6) a remote consequence is total prolapse of the uterus and inversion of the vagina, due to the weight of the contents. If a dermoid ruptures, the contents cause a plastic peritonitis, with considerable fever and abdominal pain. When such a case is operated upon, there is considerable difficulty in cleansing the peritoneum, and a fatal peritonitis may result from putrefaction of portions impossible to remove.

The rupture of a pseudomucin or particularly a serous cystadenoma is likely to be followed by implantation metastasis of the epithelial elements on all portions of the parietal and visceral peritoneum (*pseudomyxoma peritonei*).

Prognosis.—A ruptured cyst does not necessarily demand immediate operation. Small follicular cysts and more rarely parovarian cysts may be spontaneously cured in this way. The opening in the cyst usually closes, and the cyst refills. Cystadenomata and dermoids require prompt operation.

Treatment.—(1) If the cyst is a small one, which ruptures during a bimanual examination, and there are no immediate symptoms, wait. (2) If the cyst is large, immediate operation, being careful to cleanse the peritoneum and remove all visible traces of the cyst contents, to prevent implantation metastasis. (3) In a dermoid cyst, unless sure that all particles have been removed, it is safer to drain.

(3) **Intracystic hemorrhage** is usually a consequence of twist on the pedicle. It is often profuse enough to cause severe shock, and may be fatal. It is rarely seen at other times, but may be due to: (1) tapping; (2) spontaneous rupture of a vein. The symptoms are the same as those of severe internal hemorrhage from any cause, and the treatment is immediate operation, removal of the cyst and stimulation, with either intravenous injection of salt solution or transfusion.

Degenerations of Ovarian Cysts.—(1) *Papillary degeneration* can occur in any type of ovarian cyst, but is rare except in the serous cystadenomata. These latter almost invariably show it. The papillary masses are found in the cyst, and on its surface (by the rupture of a locule overfilled with papillary growth).

They give implantation metastasis everywhere throughout the abdomen. There is usually associated ascites, so that an ovarian cyst with ascites may safely be assumed to be papillary or malignant. Papillary degeneration is essentially malignant, and recurrences (inoperable) after removal are the rule. If the papillary growth is extensive, the operation is likely to be complicated by excessive bleeding.

FIG. 76.—Bilateral serous cystadenoma of the ovary, with papillary degeneration. The cyst on the right has ruptured and turned inside out. (*After Penrose.*)

(2) *Carcinomatous degeneration* is usually a result of primary papillary degeneration, and associated with ascites. It has a tendency to give early metastasis into the retroperitoneal tissues of the broad ligament and also by inplantation metastasis over the peritoneum. Cachexia and wasting are marked and rapid. These patients do not stand operation well, and if the involvement of neighboring structures is extensive, complete removal is better not attempted. Even in apparently uncomplicated cases, recurrence is the rule and prognosis

for cure is very bad. The most favorable cases are those where the malignant process is confined to an unruptured cyst.

(3) *Infection and suppuration* occurs: (1) As a result of infection after labor; (2) as a result of twisted pedicle; (3) by infection from bowel adhesions; (4) by tapping. Any cyst may become infected, but dermoids are the commonest.

Symptoms are those of acute infection from any cause: fever, rapid pulse, leukocytosis, chills, etc.—plus the cystic abdominal mass.

Treatment.—Early operation and removal of the cyst without opening it. The septic intoxication is often profound and delay is dangerous. Adhesions are found early and rupture into the bowel, bladder, vagina or peritoneum is not uncommon. The latter is aways fatal. In other cases the drainage is only partial and operation is urgently required. Drainage is required, especially in those cases where there has been rupture of the cyst into the bladder, bowel or vagina. The fistula should be closed, but will usually reopen. In desperate cases, where no prolonged operation can be attempted, marsupialization of the cyst to a small abdominal incision and its drainage is advisable. Later the cyst can be removed.

(4) *Implantation metastases* are the result of: (1) Papillary degeneration; (2) malignant degeneration; (3) rupture of a cyst; (4) spilling the contents in the peritoneum during operation. They occur all over the visceral and parietal peritoneum even in distant portions of the abdominal cavity. They are composed of the epithelial elements of the cyst and secrete pseudomucin, until the whole cavity becomes filled with semisolid gelatinous masses that cannot be removed. This condition is called *pseudomyxoma peritonei* and while in itself benign, it causes a form of chronic peritonitis which eventually kills the patient. Life may be prolonged by repeated laparotomies and removal of as much of the growth as possible, and rarely it happens that a single operation effects a cure. As a rule the prognosis is bad.

Prognosis of Ovarian Cysts.—If papillary degeneration be

included in malignancy, about 25 per cent. of cysts are malignant. In uncomplicated cysts, operation is simple and safe. In intraligamentary cysts it may be a most formidable procedure. The complications with the greatest immediate danger are twist on the pedicle and suppuration. The prognosis of malignant growths is bad, and the recurrence is usually rapid and always inoperable. The least dangerous of all cysts are the simple follicular and parovarian. Serous cystadenomata are constantly bilateral, the others only occasionally.

IV. Displacements of the Ovary

Displacements of the ovary occur through a rather limited range. It may become adherent, during the puerperium while the uterus is large, and remain fixed high out of the pelvis. Congenitally the ovary may fail to descend, but remain at the embryonic level, near the kidney. Clinically, the chief displacement is **prolapse of the ovary** into Douglas' pouch.

Causes.—(1) Violent exercise or traumatism; (2) secondary to retroversion of the uterus; (3) increase in size and weight of the ovary; (4) tumors.

It is more common in nulliparous women and is due to elongation of the infundibulopelvic ligament. It is either (1) primary or (2) secondary (to retroversion of the uterus) and, if primary, is commonest on the left side.

Symptoms.—(1) Very often no symptoms whatever, being discovered accidentally during an examination for other conditions; (2) pelvic pain, worse when on feet; (3) pain worse before and just after menstruation; (4) worse on coitus and defecation; (5) occasionally nausea and sickening pain, particularly after any jar or jolt.

Diagnosis.—The ovary can be felt best by rectal examination, as a round, tense and elastic body, lying in Douglas' pouch, below the uterosacral ligaments. Any doubt as to its character can be settled by the distinctive sickening pain caused by pressure on it.

Treatment is either palliative or operative. In patients without symptoms, treatment is of course unnecessary.

Palliative Treatment.—(1) Digital reposition of the ovary to as high a level as possible, by pressure through the rectum or vaginal vaults; (2) knee-chest posture for one-half hour three times daily; (3) pessaries and tampons are useless. Palliative treatment is of use only when the ovary is *not adherent.*

Operative Treatment.—(1) Through a median abdominal incision the ovary is brought up and inspected. (2) If any portion is diseased or cystic, that portion can be resected by a V-shaped excision, and the wound closed with *interrupted* (never continuous) stitches of number 1 chromic catgut, taking a deep bite of the ovarian tissue and tied gently so as not to cut. (3) The infundibulopelvic ligament is caught with a hemostat near the ovary and again at the pelvic wall, under the sigmoid. (4) With a curved intestinal needle, armed with fine linen thread, the ligament is picked up at three or four places about one-half inch apart, using the stitch as a continuous one. (5) When the stitch is tied, the ligament is so shortened as to lift the ovary to the level of the cornu of the uterus. (6) If the ovary is grossly diseased, it must be removed and not suspended. (7) The abdomen is closed.

Ovarian prolapse, secondary to retroversion of the uterus usually disappears on correction of the retroversion. If not, the ligament can be shortened in addition.

V. Inflammation (Oöphoritis) and Abscess

Inflammation of the ovary is either (1) *acute* or (2) *chronic.*

Acute inflammation is due to: (1) Streptococcus pyogenes after miscarriage or labor at term; (2) gonorrhea; (3) colon bacillus; (4) pneumococcus; (5) typhoid bacillus. This is approximately the order of frequency of the most common infections, puerperal streptococcic being overwhelmingly the most common. Gonorrheal ovarian abscess is almost invariably secondary to tubal abscess. Except in gonorrheal infection, the bacteria enter the ovary through the lymphatics

and blood-vessels at the hilus. Gonorrhea invades the ovary from the lumen of the tube, through a recently ruptured Graafian follicle.

Symptoms are those of acute pelvic inflammation and cannot be diagnosed, except at operation, from acute tubal inflammation. This latter is the commoner condition and operation, if needed, is based upon this diagnosis. (1) Acute abdominal pain; (2) fever; (3) rapid pulse; (4) leukocytosis (18,000 to 24,000); decubitus of peritonitis; (6) by bimanual examination, a very sensitive pelvic mass, behind the uterus. An acutely inflamed ovary is much more painful than an acutely inflamed tube, which fact may aid in diagnosis.

Treatment.—As many cases do not reach the suppurative stage, palliative treatment is advisable, by: (1) rest in bed; (2) milk or liquid diet; (3) ice bag or hot flaxseed poultice to lower abdomen; (4) hot vaginal douches, 120°F., four times a day; (5) moderate laxatives.

Under this treatment the acute stage may completely subside, and spontaneous recovery occur. There are often dense adhesions formed, however, which necessitate secondary operation, for relief of pain, especially at the periods. If the acute symptoms do not subside within three days, or if there is steady increase in leukocytes and fever, operation is usually required. The affected ovary and tube are removed, as described in the operative treatment of salpingitis. In all except the gonorrheal or tubercular variety, drainage is required.

Prognosis.—In all except the streptococcic variety, prognosis is good. A streptococcic ovarian abscess is the most virulent of all the localizations of septic infection, drainage is absolutely necessary, and in spite of this, the mortality from peritonitis is high.

Chronic oöphoritis is secondary to salpingitis, or any other chronic inflammatory process in the pelvic cavity, or it persists after an acute attack, without abscess formation.

Pathology.—(1) The whole ovary is enlarged, firm and heavy;

(2) hyperplasia of the interstitial connective tissue; (3) many follicle retention cysts; (4) few corpora lutea, but many corpora fibrosa; (5) many extensive and dense adhesions; (6) as a late stage, great shrinkage of the ovary, with wrinkling of its surface (cirrhosis).

Symptoms.—(1) Pain low down in the groin, worse just before and after menstruation; (2) pain on defecation, coitus or any sudden jar or jolt; (3) menorrhagia, with a tendency to become scanty in the later stages; (4) intermenstrual pain; (5) profound and varied neurosis.

The pain in these cases is due to peritoneal adhesions, and not to the ovary itself. Hence "ovarian neuralgia" is a misnomer.

Diagnosis.—(1) By bimanual examination the ovary is felt enlarged, fixed by adhesions and very tender to palpation; (2) it is often impossible to differentiate from salpingitis, except by the much greater pain of oöphoritis.

Treatment.—(1) *Palliative* consists in removing any cause of chronic pelvic congestion, if one can be found; (2) hot vaginal douching; (3) boroglycerid tampons; (4) application of tincture of iodin to the vaginal vaults.

Palliative treatment is at best of very doubtful value, and of no value at all if there is much actual disease of the ovary.

Operative Treatment.—Indications: (1) Excessive pain; (2) patients past thirty-five years of age; (3) long-standing disability; (4) degree of incapacity of the patient; (5) women of the working class. The operation should be as conservative as possible. It is frequently possible to break up adhesions and, if the ovary is not grossly diseased, to suspend it as described in prolapse of the ovary. Multiple cysts can be punctured; if the disease is confined to one portion of the ovary, that portion can be resected, especially in young women who desire children; if the whole ovary is grossly diseased, oöphorectomy is necessary. If the condition is bilateral, a small portion of one ovary should be saved, if possible, to avoid the surgical menopause.

VI. Implantation and Transplantation of the Ovary

If, after castration, a piece of the ovary is transplanted, preferably into the muscle of the abdominal wall, or between the leaves of the broad ligament, the follicles continue for awhile to ripen and menstruation can be maintained. Eventually, and in a comparatively short space of time, atrophy takes place, and menstruation ceases.

In a few cases, where the ovary has been transplanted into the uterine cornu or tube, pregnancy has occurred, even when the ovary is transplanted from one individual into another.

If a piece of ovary is transplanted into the muscular layer of the abdominal wall, or into the broad ligament, to prevent the surgical menopause, thin slices and *not* the whole ovary, are used. The whole ovary is sure to undergo cystic degeneration. In the slices, a satisfactory blood supply is much more quickly established.

VII. Solid Tumors of the Ovary

Solid tumors of the ovary are (1) *benign* or (2) *malignant*. The benign are fibromata; the malignant carcinoma, endothelioma and sarcoma.

Fibromata are entirely benign and while they often cause ascites, this disappears after their removal and they do not recur. They are subject to calcareous degeneration and become as hard as stone. They are moderate in size, of very slow growth, pedunculated and rarely bilateral. They occur at any time of life, give few if any symptoms, unless they twist on their pedicle, or cause excessive ascites. By bimanual examination they are felt as hard, very firm, rounded tumors, usually very freely moveable. They should be removed because of the possibility of twisted pedicle and because of the associated ascites.

Malignant Solid Tumors.—(1) *Carcinoma* is primary or metastatic. It is usually medullary, commonly cystic, and

is most frequent as a degeneration of a papillary cyst. They are moderate in size, round and pedunculated. Metastatic cancer comes from the uterus, tube, bowel or even from distant organs like the liver.

Cancer is commonest between forty-five and fifty years. It is usually bilateral, grows rapidly and causes marked ascites. Pain is almost constant and is early and intense. Cachexia comes late but progresses rapidly.

Diagnosis.—Bimanual examination shows a round, moderately soft tumor, with marked ascites. The growth is often mistaken for a uterine fibroid. Because of the pain and ascites, its malignant character is fairly obvious.

Treatment.—Immediate operation, with removal of the uterus and both ovaries, even though the disease is unilateral.

Prognosis.—Recurrence is the rule, in almost 90 per cent. The recurrences do not respond to *x*-ray or radium; re-operation is useless.

(2) *Endotheliomata* are derived from the endothelium of the lymph-channels and blood-vessels. They are an intermediate form of growth, between cancer and sarcoma.

Clinically their symptoms and treatment are those of cancer.

(3) *Sarcomata* are spindle-celled, round-celled or mixed. About 25 per cent. are bilateral. They are very much like fibromata in appearance, but of rapid growth. They give metastasis early, into the retroperitoneal lymph glands and to the visceral and parietal peritoneum.

They occur at any age, and are the commonest solid ovarian tumor in childhood. The younger the patient the more likely a round-celled sarcoma, and these cases are nearly always bilateral. Ascites is marked, as it is in all solid ovarian tumors. Clinically the symptoms and treatment are the same as cancer.

Prognosis.—It is not quite as malignant as cancer, but recurrence can be expected in at least 66 per cent.

VIII. Tuberculosis of the Ovary

Tuberculosis of the ovary is secondary from the tube or peritoneum. It is very doubtful if it is ever primary. Miliary peritoneal tuberculosis attacks the surface of the ovary but not its stroma.

The symptoms and treatment are the same as tubercular salpingitis.

CHAPTER X

DISEASES OF THE PERITONEUM AND PELVIC CONNECTIVE TISSUE

General Anatomy.—The pelvic peritoneum covers all the pelvic viscera except the ovaries. It dips into Douglas' pouch, thence up over the posterior uterine surface, over the fundus uteri, along the anterior uterine wall and over the top of the bladder and becomes continuous with the parietal peritoneum

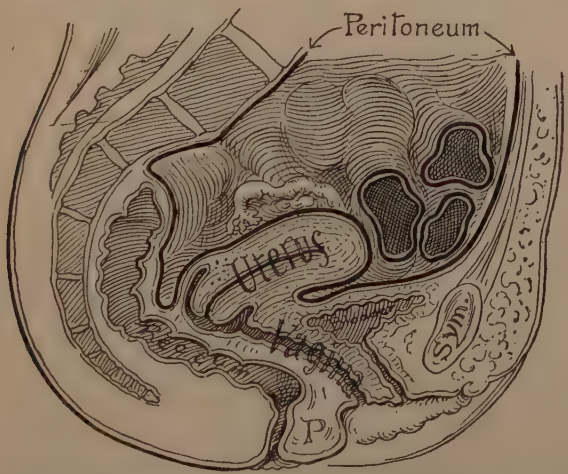

FIG. 77.—Heavy black lines indicate reflection of peritoneum. Note the difference in the anterior and posterior uterine reduplication.

of the anterior abdominal wall. The uterorectal pouch or Douglas' pouch is deeper than the uterovesical.

The *pelvic connective tissue* (pelvic cellular tissue) fills the space under the pelvic peritoneum and in the bases of the broad ligaments. That lying near the uterus is the *para-*

metrium; near the bladder, the *paracystium;* near the rectum, the *paraproctium.* The general term for inflammation of any portion of the cellular tissue is *pelvic cellulitis.*

I. PELVIC CELLULITIS (PARAMETRITIS)

This is always due to infection, and is most common in that portion near the uterus.

Pathology.—(1) The overlying peritoneum is always involved; (2) the process is first edema, then round-cell

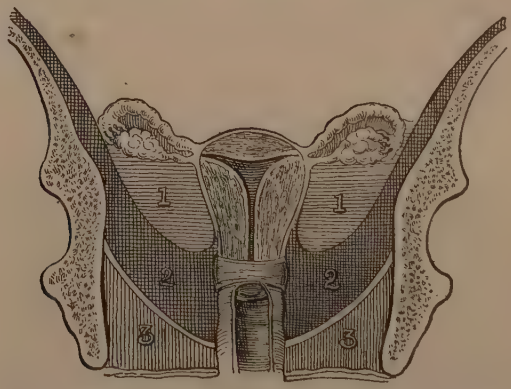

FIG. 78.—The areas involved in pelvic cellulitis. 1. Broad ligaments. 2. Base of broad ligaments and lateral vaginal fornices. 3. Ischiorectal fossæ.

infiltration, then either suppuration or, by absorption of the edema, a dense pelvic exudate; (3) the veins passing through the tissue involved are always thrombotic, and wide extension of the thrombosis is possible; (4) suppuration is often widespread and the abscess may break into neighboring organs, usually the rectum, vagina or bladder.

Causes.—(1) Secondary to puerperal sepsis; (2) secondary to abdominal operation (most often hysterectomy for pelvic inflammation); (3) secondary to salpingitis; (4) perforation of the uterus, at curettage; (5) possibly spontaneous, from lowered resistance and colon bacillus infection.

Terminations.—(1) Complete resolution; (2) resolution with pelvic exudate and adhesions; (3) pelvic abscess; (4) rupture into bowel, bladder, or vagina; (5) diffuse peritonitis and death; (6) general septicemia.

Symptoms.—1. General symptoms of infection: (1) Fever; (2) rapid pulse; (3) leukocytosis (18,000–20,000); (4) pelvic pain; (5) chills. Local symptoms are characteristic; the cervix is firmly fixed, usually displaced forward or to one side, and the tissues beyond the vaginal vaults are as hard as stone.

Differential diagnosis from pelvic peritonitis is largely theoretical. In pelvic peritonitis the greatest induration should be anteroposteriorly; in cellulitis, laterally. As the two are always associated, this distinction is of no value. Diagnosis from a pelvic hematocele, the only other condition simulating cellulitis, is impossible without operation.

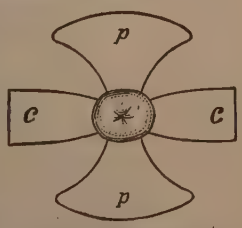

FIG. 79.—Diagram to illustrate the difference in indurated areas in pertonitis and cellulitis. Practically this is of little value, as the two are so often co-existent.

Treatment.—*Palliative:* The majority of cases subside without suppuration under palliative treatment: (1) Rest in bed; (2) liquid diet; (3) moderate laxatives; (4) ice bag to lower abdomen; (5) hot vaginal douches (½ oz. salt to Oiv. hot water, 120° F.) four times a day; (6) tampons do no good and often harm. If in a week of this treatment, there is not marked improvement, operation will usually be necessary.

Operative Treatment.—Indications: (1) When there is no improvement after palliative treatment; (2) persistent fever and chills; (3) persistent high leukocyte count; (4) softening of the pelvic mass, bulging of the lateral or posterior vaginal vaults.

If there is any doubt as to the mass being extra or intraperitoneal, exploratory section is indicated. If the mass is intraperitoneal, it is drained through the lower end of the abdominal incision; if extraperitoneal, the abdominal wound

is closed and the abscess drained through the posterior vaginal vault.

Pointing of the Abscess.—Most commonly, the pus burrows between the vagina and rectum, bulging the posterior vaginal vault forward. Depending upon the point of infection, it may point in the thigh, perineum, abdomen or even the back, but the posterior vaginal vault is overwhelmingly the most common.

Posterior vaginal section (posterior colpotomy) is the operation of choice, if the abscess is extraperitoneal.

Technic.—(1) The patient is arranged in the dorsal position, prepared as for any vaginal operation and anesthetized.

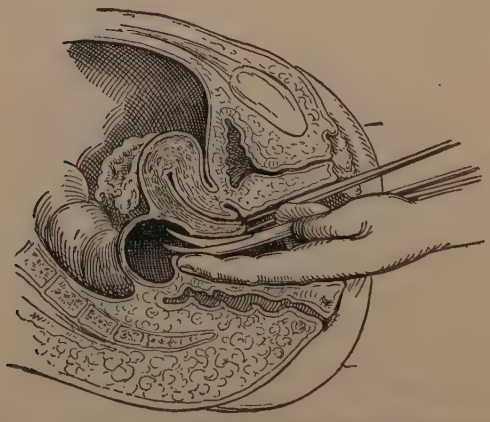

FIG. 80.—Opening a pelvic abscess through Douglas' pouch.

2. The posterior lip of the cervix is seized with a double tenaculum.

3. A semicircular incision is made, through the vaginal mucosa at its attachment to the cervix.

4. A long-handled, curved, sharp-pointed scissors, with the blades closed, is plunged in the mass, keeping *strictly* to the middle line and close to the uterus. The blades are widely opened and withdrawn open.

5. To secure a wider space, the opening is dilated with ordinary branched uterine dilators.

6. The cavity is explored with the finger (to avoid hemorrhage and injury to the ureter) and all palpable septa are broken.

7. The cavity is washed out with sterile water.

8. If much pus was found, the cavity is drained at once with a large T-tube. If only broken-down cellular tissue and

FIG. 81.

FIG. 82.

FIG. 81.—T-shaped rubber drain. It is important that the rubber tubing be of large caliber, to prevent occlusion by clots. The straight bar extends completely through the T arm, so that drainage is in a straight line. The function of the cross bar is solely to hold the tube in. (*B. C. Hirst.*)

FIG. 82.—T rubber drain seized in grip of dressing forceps preparatory to insertion through hole in vaginal vault. (*B. C. Hirst.*)

little pus was found, the cavity is packed with gauze for forty-eight hours; the gauze is then removed and a T-tube inserted.

9. Through the tube, which is cut off so as to project about

one-half inch from the vulva, the pelvis is irrigated once daily and the tube is not removed until the temperature is persistently normal and all pus has ceased.

If the pelvic cellulitis is due to a large pyosalpinx, palliative treatment and abdominal section after the acute symptoms have subsided is better than vaginal section. This latter may have to be done as a life-saving measure, but it always complicates the section.

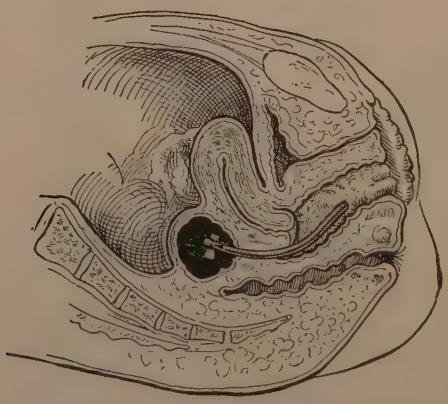

FIG. 83.—Drainage of a pelvic abscess, with a T rubber drainage tube.

Prognosis.—(1) Puerperal infections are not as favorable as the non-puerperal; (2) the end result is usually one of chronic pelvic cellulitis, requiring prolonged treatment; (3) prolonged necrosis in the cellular tissue may prove fatal; (4) phlegmasia alba dolens (milk leg) and pulmonary embolus are not uncommon.

Chronic Cellulitis.—After the acute stage has subsided and resolution is established, or after posterior colpotomy, there often remains induration of the uterosacral ligaments and bases of the broad ligaments, without fever or leukocytosis, but with considerable pain. The thickened areas can be felt plainly, by vaginal examination.

Treatment.—(1) Hot vaginal douching; (2) boroglycerid

tampons; (3) 7 per cent. tincture of iodin to vaginal vaults, once weekly; (4) laxatives; (5) avoidance of coitus or any other cause of pelvic congestion (heavy exercise or work, cold baths, rest at time of periods, etc.).

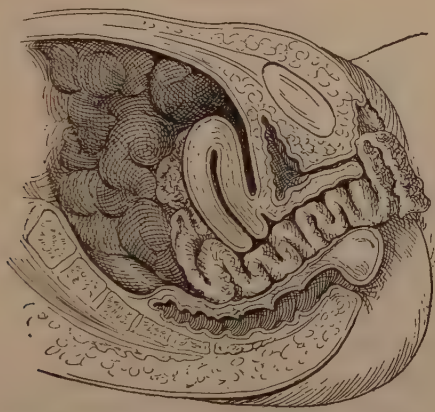

FIG. 84.—A pelvic abscess opened through the posterior vaginal vault and drained with gauze.

II. PELVIC HEMATOCELE (PARAMETRIAL HEMATOMA)

This is a collection of blood in the uterorectal or uterovesical pouch, or between the layers of the broad ligament.

Causes.—(1) Much the commonest is tubal abortion in extra-uterine pregnancy; (2) injuries to the uterine walls (rupture or perforation); (3) imperfect hemostasis after operations, especially hysterectomy; (4) rupture of a varicose vein in the broad ligament.

Symptoms.—(1) Essentially those of cellulitis, with less fever and leukocytosis, unless the hemorrhage is sudden and profuse; (2) in the latter case, shock, signs of internal bleeding and acute anemia; (3) after the mass is encapsulated by adhesions, pressure on bowel and bladder are marked; (4) at any time it is subject to infection from colon bacilli and abscess formation.

Diagnosis.—Bimanual examination shows the same pelvic mass as cellulitis.

Treatment.—(1) If the hemorrhage is acute and severe, as in extra-uterine pregnancy, abdominal section, tie the affected tube and remove, and remove blood clots by flushing the abdomen with sterile water. (2) If old and encapsulated palliative treatment as described in cellulitis, and posterior colpotomy and drainage *only if it becomes infected*.

III. PERITONITIS

Peritonitis may be either (1) local or (2) diffuse. It is *localized:* (1) *in the pelvis*, either in Douglas' pouch or in the uterovesical space, secondary to either a tubal or uterine infection; (2) around the appendix; (3) around intestinal perforations; (4) around the gall-bladder.

Diffuse peritonitis is most common from (1) acute appendicitis with perforation; (2) streptococcic infection after labor or miscarriage; (3) rupture of gonorrheal pyosalpinx; (4) perforation of stomach or bowel; (5) perforation of gall-bladder.

Types.—(1) Serous, with ascites; (2) seropurulent; (3) purulent; (4) plastic (tubercular usually); (5) fulminant.

Pelvic peritonitis is much most commonly due to gonorrhea. Every case of gonorrheal salpingitis is accompanied by pelvic peritonitis. It is also associated with all cases of cellulitis. The symptoms and treatment are the same as cellulitis.

Diffuse peritonitis is a much more dangerous type. That from a perforated appendix is the least dangerous; that from streptococcic infection of the uterus, tubes or ovaries the most fatal.

Symptoms.—(1) Great abdominal pain; (2) usually but not invariably, abdominal rigidity; (3) fever (which is usually much higher by rectal temperature); (4) leukocytosis; (5) peritonitis decubitus; (6) rapid, thready, wiry pulse; (7) paresis of the bowel, with absence of peristalsis and apparent obstruction; (8) increasing abdominal distention.

The treatment is abdominal section, removal of the cause,

if one can be found, flushing of the abdomen with large quantities of sterile salt solution, drainage by rubber or glass tube, Fowler position and active stimulation. The prognosis is always doubtful. It is best in appendiceal cases; worst in streptococcic. In these latter there is often a deceptive improvement for a few hours, and then a rapid change for the worse and death in a short time.

Tubercular peritonitis occurs in three forms: (1) *Diffuse miliary tuberculosis*, always with ascites. This is the type most common in the young; (2) *diffuse peritonitis*, with extensive adhesions, without ascites. This is the *plastic* or *chronic adhesive* type; (3) *nodular tubercular peritonitis*, with numerous nodes in the peritoneum and mesentery. This type is the rarest, and most often mistaken for cancer.

The source of tubercular peritonitis is: (1) Secondary to tuberculosis of the tubes (most common); (2) by blood-current infection from active foci elsewhere in the body.

Symptoms vary with the type of the disease. In the first type; there are often no symptoms until considerable ascites has collected. The patient is ill-developed, thin, often with amenorrhea, often shows general constitutional symptoms such as night sweats, slight fever and digestive disturbances. The ascites is often sufficient to cause considerable distention and dyspnea.

The symptoms of the second type are the same, except for *less* distention and *more* abdominal pain.

The symptoms of nodular peritonitis are more grave. The patient is obviously seriously ill, with fever and rapid pulse; there is often pus and blood in the stools and even in the urine; the nodular masses can be felt, and because this type occurs in patients in middle life, cancer is likely to be suspected.

Diagnosis.—In the ascitic type, marked ascites in a patient (especially in youth) not associated with kidney, heart or liver disease, is almost certainly of tubercular origin.

The tuberculin and von Pirquet tests are not conclusive, though valuable presumptive signs.

In the second and third types, accurate diagnosis is often impossible, exploratory section being the only means of making certain.

Treatment.—Ascites, if excessive, is best removed by a small incision, rather than tapping, because of the danger of perforating an adherent coil of intestine. If the Fallopian tubes are affected they should be removed, as little handling of the intestines as possible being essential, and the abdomen closed. In the plastic type, the adhesions are usually too extensive to be broken up, and the abdomen should be closed without meddlesome attempts to achieve the impossible.

In the nodular type, the abdomen is closed at once, without attempt at removal of any of the nodes.

No tubercular peritonitis case should ever be drained, as a permanent fistula is sure to result.

Prognosis is usually good. Astonishing improvement and often complete symptomatic cure will follow a simple exploratory section. No definite reason can be proven for this, though these theories are advanced; (1) admission of light and air (doubtful); (2) change from the ascitic to the plastic type, by evacuation of the ascites; (3) the old ascitic fluid is replaced by fresh, with a high bacteriolytic power.

IV. DRAINAGE OF THE ABDOMEN AFTER OPERATION FOR PELVIC INFECTION

Indications.—(1) All streptococcic cases, without exception; (2) Abscess sacs, difficult or impossible of enucleation; (3) where intestine is injured and perforation is feared (here by tube or rubber tissue only and never gauze); (4) to control bleeding; (5) diffuse peritonitis.

Contra-indications.—(1) Tubercular peritonitis; (2) syphilis; (3) in any case of doubt as to the necessity, do not drain.

Dangers of Drainage.—(1) Intestinal obstruction; (2) adhesions; (3) perforation of bowel; (4) hemorrhage when drain is withdrawn.

Methods of Drainage.—(1) By tube and gauze, through the

lower end of the abdominal wound; (2) by tube or gauze through Douglas' pouch, into the vagina; (3) by a combination of the above, or through-and-through drainage.

The best method, where drainage is needed for infection, is by glass tube and gauze through the lower end of the abdominal incision. This is especially necessary in cases of streptococcic infection.

Technic.—(1) Just before the abdomen is closed the pelvis is sponged as clean as possible.

2. A curved glass drainage tube about the size of the fore-

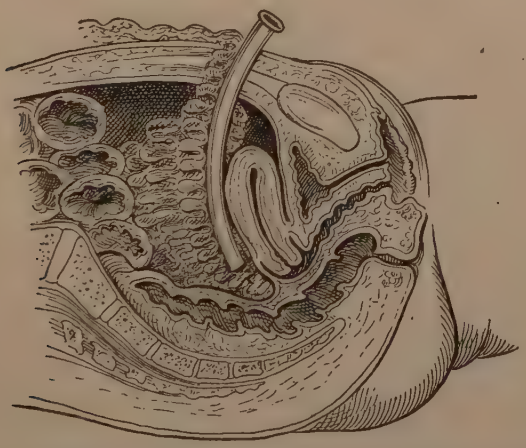

FIG. 85.—Abdominal drainage by glass tube and gauze; the most efficient type of drainage in septic conditions in the pelvis.

finger is put in the bottom of Douglas' pouch. The curved is better than the straight tube, because it can be brought out nearer the symphysis, and hence lessens the danger of hernia.

3. Under and around the tube is packed a gauze strip, usually four layers one and one-half inches wide (made by folding a six-inch bandage), so that the entire pelvis and all the intestines held above the pelvic brim. The end of the gauze is brought out along the tube.

4. The protective sponges are now removed and the abdomen closed around the tube and gauze.

The vaginal method of drainage (through an opening in Douglas' pouch) is not safe, in septic cases, and should be avoided.

After-care.—(1) Every twenty-four hours, the glass tube is sucked out, by a piston syringe and catheter, for the first five days. The amount of fluid will diminish from about an ounce the first day to a couple of drams on the fifth. (2) The patient is kept in the Fowler position and the Murphy drip (glucose one and a half ounces, sodium bicarbonate one and a half ounces, water two pints, forty drops a minute, temperature kept near 110°) is used. (3) All these patients need rather active stimulation, particularly in the second twenty-four hours. (4) On the fifth day the glass tube is removed. (5) Beginning on the sixth day, the gauze is removed, taking out about one-quarter of the total amount each day, so that by the tenth or eleventh day, it is all out. (6) As soon as the last of the gauze is out, a rubber tube is inserted, in the sinus left by the gauze, as deep as it will go, and a safety pin put through the outer end. (7) Through this tube the pelvis is flushed daily with sterile water, run in by gravity, and the tube shortened as it is pushed out from below. (8) The usual convalescence lasts four to six weeks. Except for these points, the after care is that of the ordinary section.

Drainage through the posterior vaginal vault is indicated chiefly for bleeding from intractable oozing, in cases without active infection.

Technic.—(1) An assistant places two fingers of one hand in the vagina, making strong pressure upward in the *posterior* vaginal vault, with the finger tips separated.

2. The operator, with these fingers as a guide, perforates between them, with scissors, into the posterior vaginal vault.

3. The end of the gauze packing is grasped in a clamp and pushed into the vagina, where the assistant grasps the packing and pulls it through for a short distance.

4. The pelvis is packed full and the abdomen closed.

5. The vagina is repacked, with fresh packing, after the operation is completed.

After-care.—The packing is left undisturbed for four days, is then gradually removed over another four days and the drainage hole kept open by a T-tube, if there is much discharge.

V. PHLEBOLITHS

Phleboliths are calcified thrombi in the dilated pelvic veins. They are of no clinical importance and do not justify operation. They often cause deceptive shadows in *x*-ray plates and lead to erroneous diagnosis of ureteral stones, even when the picture is taken with catheters in place.

CHAPTER XI

ABNORMALITIES OF THE ABDOMINAL WALL

I. DIASTASIS OF THE RECTI WITH GENERAL VISCEROPTOSIS

In the last three months of every pregnancy the abdominal recti are gradually separated, by the pressure of the enlarging uterus. In cases of hydramnios or multiple pregnancy where the abdomen is overdistended, the separation may be extreme. If an abdominal binder is worn, and kept properly tight, during the puerperal convalescence, the muscles gradually assume their normal parallel course, and the support of the anterior abdominal wall is not markedly diminished. Where the abdominal binder is not worn, or discarded too soon, or not kept properly tight, permanent separation, with consequent splanchnoptosis and pendulous abdomen will result. The effects of a diastasis are chiefly those of splanchnoptosis and practically a ventral hernia. The patient, if the diastasis is marked, is incapacitated.

Diagnosis is easy. The abdominal skin is flaccid and wrinkled; coils of intestine can plainly be seen moving under the thin skin and fascia; when the patient strains, the center of the abdomen rises like a dome, and the edges of the separated muscles can be felt.

Treatment.—A separation of less than four fingers in breadth can usually be disregarded, as the symptoms are so moderate that no relief is needed. Greater separation than this gives symptoms whose severity is in direct ratio to the degree of separation. A moderate case can be relieved, temporarily at least, by an abdominal binder, preferably one which supports the abdomen as well as compresses.

A straight front corset will give good support; adhesive straps will give temporary relief. Massage and electricity

are not likely to have any beneficial effect. Exercises tending to strengthen the abdominal muscles often help the moderate cases greatly, but are useless where the separation is over four or five fingers. All these methods are merely temporary (except possibly after the first labor) and cannot be used in women obliged to do hard work. In these patients, the Webster operation will effect a cure. The principle is a long incision from the ensiform to the pubes, dissecting back the skin and fat on each side to the retracted muscles. In this process the peritoneal cavity is usually opened as the umbilicus is cut across. The small opening is closed at once, and the rest of the operation is extraperitoneal. The sheaths of the separated recti are sewed together without opening them, in the middle line, using interrupted chromic catgut number 2 for tension sutures and continuous number 1 chromic catgut stitch for approximation. The tissue lying between the muscles, is allowed to arrange itself behind the suture line, and is *not* excised. The excess of the skin is trimmed off, and if desired, a new umbilicus can be made, by a purse-string suture inverting the skin edge, at the proper point.

This operation withstands subsequent labor provided it does not occur too soon after the operation (two years at least) and proper attention is given to the abdominal binder during puerperal convalescence.

II. EXSTROPHY OF THE BLADDER

Exstrophy of the bladder is a rare condition where a part of the anterior abdominal wall, together with the fundus of the bladder is missing, and the interior of the bladder is exposed. It is associated also with failure of development of the symphysis. There is naturally complete incontinence of urine. The defect can be remedied, in part at least, with flaps taken from the abdominal wall from above and from each side.

III. HERNIA

Hernia may be: (1) umbilical; (2) incisional; (3) inguinal; (4) femoral.

Abdominal hernia is much more common in women than in men, and unless diastasis of the recti be called a hernia, umbilical is the commonest type.

Umbilical hernia varies in size from a small protrusion to an enormous sac, containing most of the intestines. There is a well-defined ring, and a marked tendency for the omentum and intestines to adhere to the sac. Incarceration, strangulation and intestinal obstruction are common complications. In all umbilical hernias there is coincident diastasis of the recti.

Symptoms.—(1) Protrusion of the umbilicus; (2) abdominal pain; (3) often constipation (due in part to the adherent bowel);

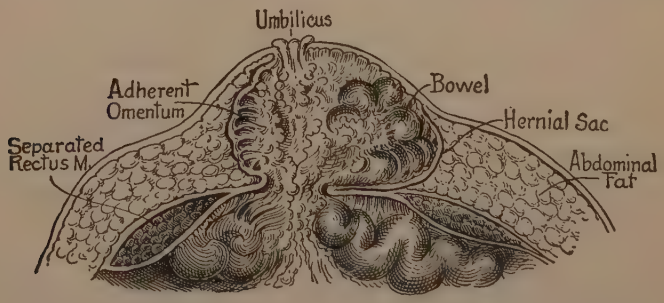

FIG. 86.—A lateral view of an incarcerated umbilical hernia. (*After Graves.*)

(4) symptoms of strangulation (pain, vomiting and obstruction) if this takes place.

The diagnosis is sufficiently obvious, due to the protruding sac at the umbilicus.

Treatment.—(1) *Palliative*, by the use of an abdominal binder, abdominal corset or by adhesive straps. It is difficult in many cases to get a properly fitting corset or binder, due to the obesity of the patient. Adhesive straps irritate the skin, if used for any length of time. Palliative treatment is recommended only if there is an absolute contra-indication to operation, or if the patient refuses operation.

(2) *Operative.*—If the hernia is large and the patient fat, the operation is a dangerous one. The chief complications are: (1) local infection and fat necrosis; (2) embolism; (3) pneumonia; (4) effects of anesthesia (on heart and kidneys). Recurrences are not infrequent and are much harder to manage than the original hernia.

Technic.—(1) A long incision is made in the middle line, encircling the protruding mass.

2. The sac, often found considerably to one side of the mid-line, is dissected out and opened.

3. All adhesions are broken up, the contents of the sac returned to the abdomen, the sac tied off and removed and the peritoneum closed.

4. The skin and fat are dissected back until the firm white aponeurosis is exposed.

5. The edges of the aponeurosis are united with number 3 chromic catgut interrupted sutures, left for the moment untied.

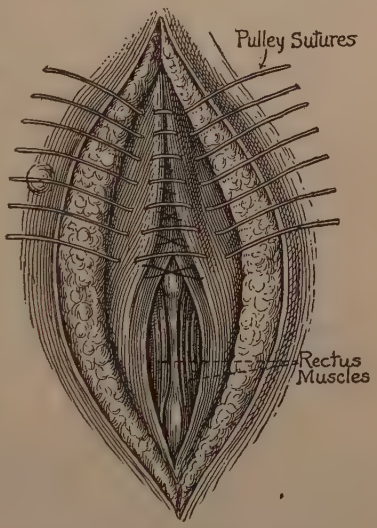

FIG. 87.—The closure of a ventral hernia. (*After Graves.*)

6. Six or seven silkworm-gut sutures are inserted, entering through the skin, fat and fascia on one side and emerging through the fascia, fat and skin on the other. Also untied.

7. The edges of the fascia are united by a continuous number 1 chromic catgut stitch, tying each interrupted stitch as it is reached.

8. The skin is closed and the silkworm-gut stitches tied. The wound is dressed as usual, and dressings are changed in forty-eight hours due to the excessive serous oozing. Patients

are kept in bed at least three weeks, the silkworm-gut sutures removed in the third week. The same principle of operation may be carried out through a transverse incision (Mayo) though there is no special gain in so doing.

Incisional Hernia, after Abdominal Operation.—*Causes:* (1) Drainage; (2) infection; (3) premature absorption of catgut; (4) excessive muscular exertion, or strain within a few months of the operation.

Development.—First there is a small protrusion at one point, usually one end of the wound. It is tender and has impulse on coughing or straining. It gradually grows, until it involves the whole wound and extends to either side. There may be a single ring or several, each with its own sac. The contents are usually omentum and this is always adherent. These adhesions usually prevent the entrance of intestine, but not if the ring grows large. There is marked tendency to strangulation and obstruction, after intestine has entered the sac.

Diagnosis is usually easy, as the protrusion is obvious and the edges of the ring or rings can be plainly felt.

Treatment is essentially the same as that given for umbilical hernia, both palliative and operative, except that a transverse incision cannot be utilized.

It not infrequently happens that the edges of the aponeurosis cannot be brought together, due to loss of tissue from infection. This difficulty can be met in several ways: (1) transplantation of fascia taken from the thighs (Bartlett's method); (2) placing a row of mattress sutures number 3 chromic catgut, across the gap, tying them as tight as possible and trusting to granulation to fill up the meshes between the stitches; (3) sewing in a silver wire mat, which must later be removed.

Recurrence after operation is disastrous, as it is much worse than the original hernia.

Inguinal hernia is much easier to manage in women, as the spermatic cord (in this case the round ligament) does not have to be considered. The fascia covering the canal is opened, the sac opened, its contents returned to the abdomen

and the sac tied off; the internal ring closed, and the inguinal canal obliterated as in the Bassini operation.

Femoral hernia is managed on the same principles in both sexes. It is often complicated by acute adenitis of the glands at the femoral ring and these must be removed at operation.

IV. OBESITY

Obesity, while not a disease of the abdominal wall, has there its most marked evidence. It is a source of considerable dis-

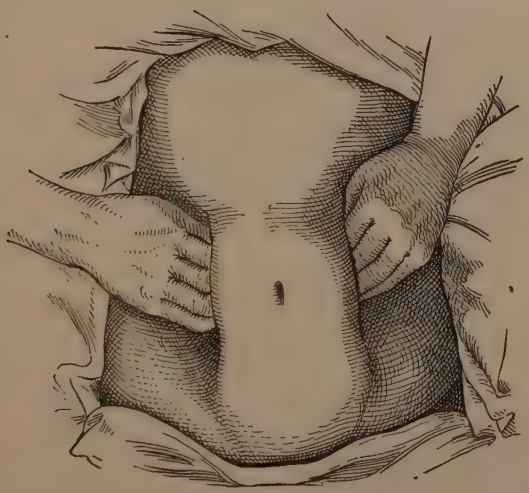

FIG. 88.—Testing the actual outline of the abdomen, by eliminating the superficial fat.

comfort to the patient, and, because it is frequently attended by sexual underdevelopment, she may be sterile.

Treatment.—(1) Diet, all starches, fats, and sugars being eliminated or minimized; (2) regular exercise (the hardest thing to get these fat patients to do), preferably walking; (3) frequent hot baths; (4) sufficient laxatives to give two movements a day; (5) thyroid extract, 5 grains three or four times daily; (6) whole pituitary gland—the anterior lobe being a

sexual developer, the posterior lobe limiting carbohydrate absorption—four grains by mouth four times daily.

FIG. 89.—Testing the abdomen for fluctuation in ascites. The hand in the center stops the fat wave on percussion.

V. PATENT URACHUS

Patent urachus usually causes an umbilical fistula, with constant, or periodic, purulent discharge. The fistula is excised and the opening packed.

VI. TUMORS OF THE ABDOMINAL WALL

Tumors of the abdominal wall are: (1) Adenomyoma of the round ligament; (2) fibrosarcoma of the sheath of the rectus; (3) lipoma; (4) sarcoma, often involving enormous areas. Phantom tumors are due to spasmodic contraction of the recti. They disappear under anesthesia; the others are permanent. Myoma of the round ligament is in the groin, is very rare, simulates inguinal adenitis and inguinal hernia, and should be removed. The inguinal canal must be obliterated, to prevent hernia.

Fibrosarcomata are small hard tumors, growing from the sheath of the recti muscles, and are in the midline. They should be removed, and are very slightly malignant.

Lipomata are essentially benign, and do not demand removal unless uncomfortable or infected.

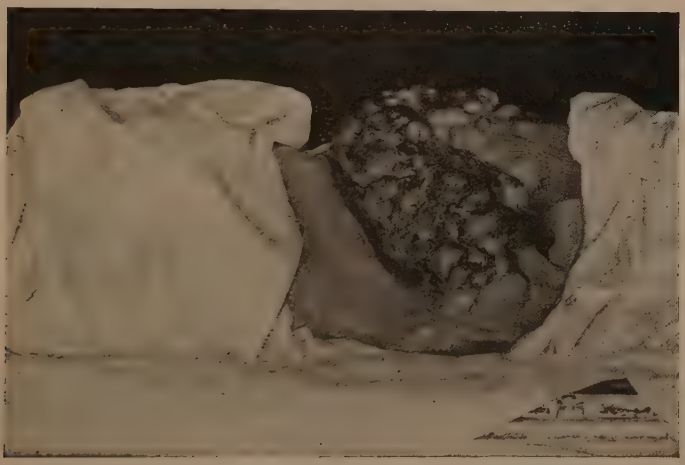

FIG. 90.—Mixed-cell sarcoma of abdominal wall, starting in a pigmented mole near the umbilicus. Two years growth. (*Seen by courtesy of Dr. H. F. Taylor, Ridley Park, Pa.*)

Sarcoma starts usually from a pigmented mole, is usually melanosarcoma, grows rapidly and is very malignant. Early removal and *x*-ray or radium offer the only chance, though a small one, of relief.

CHAPTER XII

INJURIES OF THE BIRTH CANAL, AND THEIR REPAIR

CLASSIFICATION OF INJURIES

I. **Injuries to the Pelvis.**—(1) Fracture or separation of the symphysis; (2) fracture or separation or sprain of the sacro-iliac joints; (3) fracture of ramus of pubes; (4) fracture of coccyx.

II. **Rupture of the Uterus.**—(1) Complete; (2) incomplete.

III. **Lacerations of the Cervix.**—(1) Unilateral (open or submucous): (2) bilateral (open or submucous); (3) stellate (open or submucous); (4) annular detachment.

IV. **Lacerations of Anterior Vaginal Wall.**—(1) Clean cuts of mucous membrane; (2) open or submucous tears of muscle or urogenital trigonum.

V. **Lacerations of the Perineum.**—(1) Tears of the levator ani; (2) tears of deep transversus perinei; (3) tears of anterior and posterior layers of triangular ligament; (4) tears of the bulbocavernosus; (5) tears of the superficial transversus perinei; (6) Tears of sphincter ani (complete tear).

Further divisions into: (1) Complete tear (involving sphincter ani); (2) incomplete tear (*not* involving sphincter); (3) central perforation of the perineum; (4) laceration and abrasion of labia.

VI. **Fistulæ.**—(1) Vesicovaginal (on anterior vaginal wall); (2) ureterovaginal (in vaginal fornix); (3) rectovaginal (on posterior vaginal wall).

INJURIES TO THE PELVIS

Recent injuries of the pelvic bones, except fracture of the coccyx, are complications of the puerperium, and hence belong in works on obstetrics. **Relaxation of the sacro-iliac joints** gives great discomfort, persisting often for many months after delivery. It is also possible from sudden muscular exertion or strain, entirely independent of childbirth.

Symptoms.—(1) Intense backache, aggravated by exertion, most marked over the affected joint; (2) inability to sit long in any position; (3) difficulty on arising from bed or chair; (4) occasionally so severe, if bilateral, as to make walking impossible.

Treatment.—A binder of unyielding material like heavy muslin or light canvas, laced tight over the hips to immobilize the joint; in moderate cases, lacing the lower third of the ordinary corset gives sufficient relief. The binder is worn constantly, except in bed, and is put on before the patient arises in the morning.

Recovery is slow, usually four to six months being required, and the condition returns in subsequent pregnancies.

Fracture of the coccyx is discussed in Chapter XIII, under the sequelæ of childbirth.

RUPTURE OF THE UTERUS

Rupture of the uterus is purely an obstetrical accident, and needs no discussion here.

LACERATIONS OF THE CERVIX

Causes.—(1) Childbirth (by far the commonest); (2) forcible dilatation; (3) passage or extraction of large submucous fibroids.

Forceps delivery accounts for the greatest number. The cervix is always torn if the forceps is applied before the head has passed through the cervical ring.

Kinds.—(1) Unilateral; (2) bilateral; (3) stellate; (4) annular detachment.

A *unilateral tear* involves only one side of the cervix. This type often heals spontaneously, does not cause eversion (because the uninjured side acts as a splint), and not infrequently causes no erosion.

A *bilateral tear*, involving both sides and usually more extensive on one side than the other, always causes eversion and erosion, and is the commonest type of cervical tear.

A *stellate tear* means a tear in three or more directions,

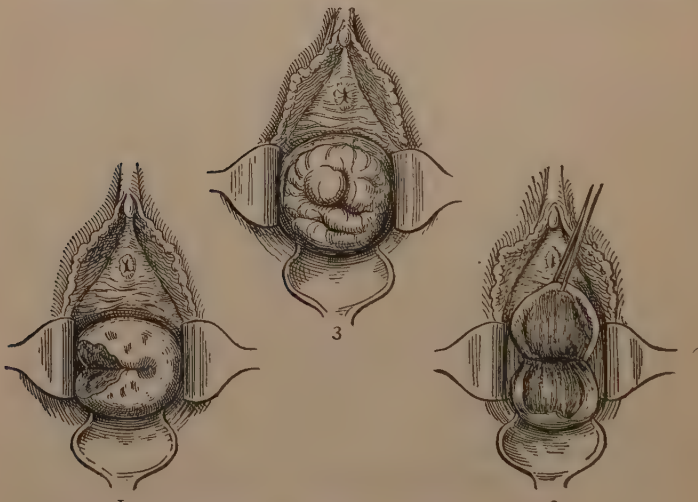

FIG. 91.—1. Unilateral laceration of the cervix. 2. Bilateral laceration of the cervix. 3. Stellate laceration of the cervix. As seen through a speculum.

usually bilateral with a vertical split in the anterior lip. This type causes eversion, erosion and hypertrophy.

Annular detachment is of no importance in gynecologic work. The cervix, partially dilated, has been torn off in labor, and unless tabs of tissue are left, the circular wound has healed and requires no repair.

Terminations.—(1) Spontaneous healing, which is uncommon, except in unilateral tears, though it may occur in the most extensive stellate ones; (2) eversion of the lips, where they

are rolled apart and gape widely; (3) erosion, a prolapse of the red columnar epithelium of the cervical canal over the squamous epithelium of the portio; the condition erroneously called "ulceration;" (4) hypertrophy of the cervical tissue, most marked of the anterior lip, and a constant accompaniment of prolapse; (5) Nabothian cysts; small pearly cysts, containing clear mucus, showing on the vaginal portion of the cervix and due to occlusion of the mouths of the glands: (6) as a late development, carcinoma. (For details of all these, see Chapter VI.)

Consequences of cervical tears, in addition to those mentioned above are: (1) leukorrheal discharge—profuse thick stringy mucopus; (2) sterility—either from changed cervical secretions or stenosis of the internal os; (3) menorrhagia—from uterine congestion; (4) multiple miscarriages.

Symptoms.—(1) Leukorrhea, of the cervical type, very profuse; (2) pelvic discomfort, if the scar tissue extends in the vaginal vault; (3) dyspareunia, for the same reason; (4) menorrhagia usually, and, if there is marked erosion, often metrorrhagia; (5) reflex symptoms (backache, hysteric neuroses, headache, etc.) of doubtful value and obscure cause.

The only constant symptom is leukorrhea. Profuse mucopurulent discharge, sufficient to require a napkin for protection, in a patient who has had a child and is free from gonorrhea, is practically always due to lacerated, eroded cervix.

Diagnosis.—(1) Digital examination is unreliable. The scar of a healed tear feels astonishingly like an open one; (2) a bivalve speculum should always be used, and the diagnosis is made by it only.

It is often very difficult to diagnose between a badly eroded cervix and early carcinoma. Both bleed easily to the touch, and in any case in the least suspicious, a piece must be excised for microscopic diagnosis.

If the tear has been extensive and involves the vaginal vaults, the resulting immobility of the uterus is very like that of salpingitis with extensive adhesions.

Treatment

Palliative treatment is useless for a cervical tear; while erosion can be temporarily diminished, it recurs as soon as treatment is stopped. The only treatment is (1) repair or (2) amputation.

Choice of Method.—It is difficult to lay down a dogmatic rule, and each case must be judged on its merits; but as a general thing it is safe to say that unilateral and bilateral tears, without hypertrophy, can be repaired, while stellate tears and hypertrophy of the cervix require amputation.

Cicatricial bands often form from the side of the cervix to

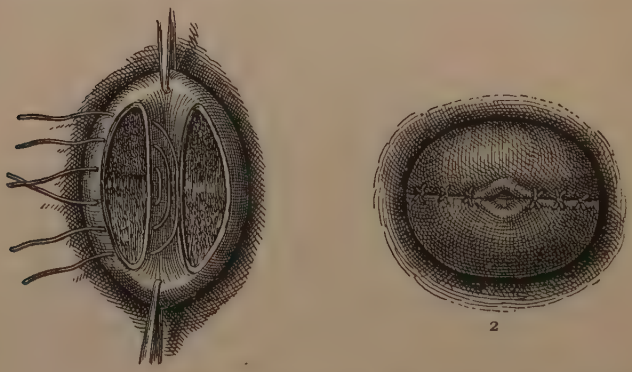

Fig. 92.—1. The method of denudation and placing the stitches for Emmet's trachelorrhaphy. 2. The repair completed.

the vaginal vault. They are usually raised ridges of dense scar tissue, but may be actual circular bands. They should be excised before any repair is attempted.

Repair of the cervix (Emmet's trachelorrhaphy) is one of the few operations in gynecology, if not the only one, still done in its original form, and never improved upon, except for the kind of suture material.

Technic.—(1) The patient is anesthetized and prepared as for any vaginal operation.

2. The anterior and posterior lips of the cervix are caught with tenacula, pulled down and separated.

3. The edges of the denudation are marked out, as in the diagram, care being taken to limit the denudation to the area of the laceration and not to encroach upon the cervical canal. The shape of the denudation is triangular, on each lip.

4. Interrupted stitches, of number 3 forty-day chromic catgut are placed, beginning on the mucous membrane of the vaginal aspect of the anterior lip, emerging close to the mucous membrane of the cervical canal, entering again close to the edge of the mucous membrane of the canal on the posterior lip, and emerging on the vaginal aspect of the posterior lip, opposite the point of entrance on the anterior lip. Three or four sutures to a side are required.

5. The stitches are tied, after all are inserted.

Care should be taken not to close the canal too tightly. When all stitches are tied, the cervical canal should have a caliber of a number 17 French sound, otherwise there may be a secondary dysmenorrhea. If the tear is unilateral, only one side is denuded and repaired.

At times an accurate repair of a bilateral tear may be prevented by hypertrophy of the mucous membrane of the canal. A wedge-shaped exsection of the mucosa will obviate the difficulty and avoid amputation of the cervix. A repaired cervix *never* withstands subsequent childbirth and is sure to tear again.

Amputation of the cervix is best done by the Hegar method, as no other gives such uniform accurate coaptation of the edges of the wound.

Indications.—(1) Stellate tears; (2) hypertrophy of the cervix, (3) very extensive tears, unilateral or bilateral, involving the vaginal vaults; (4) severe endocervicitis with marked erosion and excessive leukorrhea; (5) in all cases of prolapse of the uterus.

Advantages.—(1) It allows a neater coaptation of the wound edges, in the cases where it is indicated; (2) leukorrheal discharge is greatly lessened; (3) it withstands subsequent childbirth much better than repair.

Disadvantages.—(1) Danger of secondary cervical stenosis and dysmenorrhea; (2) tendency to repeated miscarriage, if the cervix is amputated high; (3) unnecessary if a neat result can be obtained by repair, which is both quicker and easier.

Technic of Amputation.—(1) The patient is in the dorsal position, prepared as for any vaginal operation and anesthetized.

2. The anterior and posterior lips of the cervix are caught by tenacula.

3. A circular incision is made around the cervix, to free the vaginal walls at their attachments.

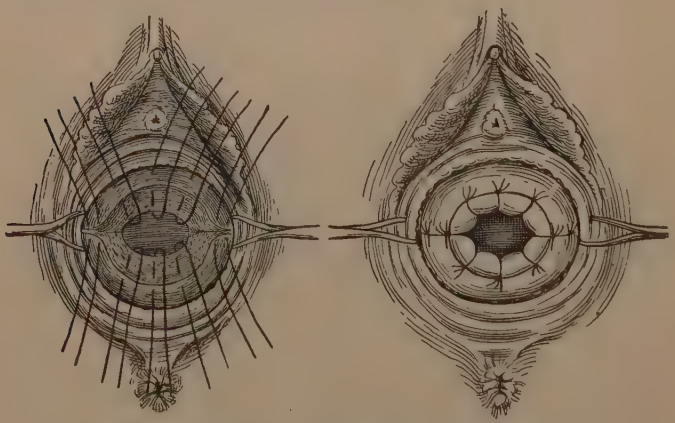

FIG. 93.—Hegar's amputation of the cervix.

4. The cervix is amputated as a cone, and any actively bleeding points (usually few) tied with number 0 plain catgut.

5. With heavy curved needle, armed with number 3 chromic (40-day) catgut, the sides of the cervix are repaired, taking the anterior vaginal mucosa, the muscle of the cervix and the posterior vaginal mucosa. Two interrupted stitches are placed on either side of the cervical canal; none are tied as yet.

6. With the same needle and similar catgut, two interrupted stitches are placed in each lip, in the middle line, emerging in the cervical canal, so as to make, when tied, a new external os.

7. All the stitches are now tied, the lateral ones first, then

those forming the anterior lip of the new external os and then the posterior.

8. If any extra stitches are required to secure perfect coaptation they are inserted after the others are tied. The cervical canal should be about 17 (French scale) in caliber.

After either repair or amputation of the cervix, patients should remain in bed for one or two weeks, depending upon whether other plastic work was done at the same time. Coitus should be forbidden for at least two months. If secondary stenosis results, the canal can be dilated, as an office procedure, by steel bougies, under strict asepsis.

Dates of Repair.—Like any other plastic operation, these may be primary (within forty-eight hours of injury); intermediate (two to fourteen days after injury) or secondary (after fourteen days). The first two are concerned with the puerperium only. The secondary repair is the usual gynecologic operation.

LACERATIONS OF THE ANTERIOR VAGINAL WALL

Lacerations of the anterior vaginal wall are (1) clean cuts of the mucous membrane (of importance only directly after delivery, because of bleeding); (2) laceration of the muscle and fascia of the urogenital trigonum; (3) vesicovaginal fistula.

Causes.—(1) Injuries of childbirth, almost exclusively.

2. Very rarely, the passage of a submucous fibroid, large enough to simulate the mechanism of delivery of a fetal head.

Muscle of the Urogenital Trigonum.—This is the analogous muscle to the compressor urethræ in the male. It arises at the junction of the symphysis and descending ramus of the pubis, and runs diagonally back above the anterior vaginal wall. It divides and joins its fellow from the opposite side above and below the urethra, inserting into the fascia of the anterior vaginal wall. It is the only direct muscular support possessed by the lower third of the anterior vaginal wall, to which it is a levator, and acts as a compressor urethræ. A tear of

this muscle is one of the factors in the production of a cystocele, and also accounts for many cases of incontinence of urine in later years.

Diagnosis of Injury.—With the patient in the dorsal position, the forefinger of one hand is inserted in the vagina, and pressure made straight up, to either side of the urethra, against the lower edge of the pubic bone. If the muscle is torn, the finger presses against the sharp edge of the bone. If it is not torn, a flat ribbon of muscular tissue and fascia is felt between the finger and the bone. On inspection, the lower portion of the anterior vaginal wall bulges downward, if the muscle is torn.

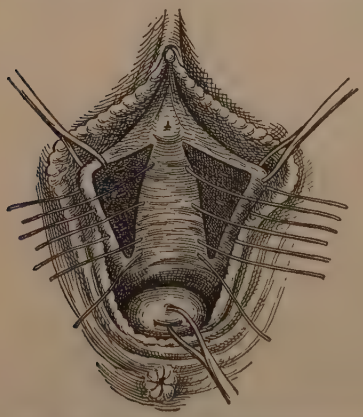

FIG. 94.—Repair of the muscle and fascia of the urogenital trigonum.

Consequences of laceration are: (1) Cystocele; (2) urethrocele; (3) incontinence of urine on effort, such as sneezing, coughing, etc.

Technic of Repair.—(1) Dorsal position, usual preparation and anesthesia.

2. The anterior vaginal wall is caught by a double tenaculum, just to the outer side of the urethra.

3. A second tenaculum catches the labium on the same side, at the same level.

4. When these are separated, a triangular sulcus is seen on the lateral aspect of the anterior vaginal wall, with the point toward the cervix.

5. This sulcus is denuded and the muscle repaired with a continuous tier stitch of number 1 forty-day chromic catgut.

Interrupted sutures can be used, but the continuous is quicker and better.

VESICOVAGINAL FISTULA

Vesicovaginal fistula is discussed in Chapter XV on Genital Fistulæ.

TEARS OF THE POSTERIOR VAGINAL WALL AND PERINEUM

As perineal tears are almost invariably the result of childbirth, and as practically all of them admit of repair during the puerperium, the subject is considered here from the obstetrical as well as the gynecologic standpoint. Were all patients properly repaired after delivery, the need for any plastic operation at a later date would be nearly eliminated.

The great majority of patients who have had children have some degree of perineal tear. The degrees of tear are variously classified, the more common division being (1) first-degree tears, involving only the tissues of the perineal body in the middle line; (2) second-degree tears, involving the levator ani and (3) third-degree tears, involving the sphincter ani.

Lacerations of the vulva and labia are really only abrasions. They are rarely deep, and unless attended by bleeding, do not require sutures.

Tears of the Vagina, Pelvic Floor and Perineum.—The structures injured are: (1) Levator ani (the main muscular support of the pelvic floor; (2) deep transversus perinei—torn in the middle line, and retracting to either side; (3) the fascia anterior and posterior to the deep transversus perinei—the anterior and posterior layers of the triangular ligament; (4) the superficial transversus perinei; (5) the bulbocavernosus; (6) the sphincter ani, if the tear extends that far in the middle line.

Tears of the levator ani are two kinds: (1) Forceps cuts, which may be anywhere in the course of the muscle and are usually a more or less complete division at right angles to the fibers and (2) spontaneous tears, in which the muscle tears loose from its tendinous attachment to the descending ramus of the pubes, and tears obliquely downward across the fibers of the

muscle, but not through them, so that the tear opens out as a book is opened, when stood upon its back. This muscle is the main support of the pelvic floor, and its injuries are attended by the well-known effects of such a tear; sense of loss of support, rectocele, and later prolapse of the uterus.

The tear may be either open or submucous; the open tears are easy to see and feel, the submucous tears are often overlooked and result later in the misnamed "relaxation of the pelvic floor."

Causes of Perineal Tears.—(1) Spontaneous delivery; (2) forceps (almost invariably cause a tear); (3) hurried delivery; (4) posterior shoulder of child will often make or extend a laceration; (5) contracted pelvis—the narrow pubic arch forcing the head posteriorly; (6) occipitoposterior positions; (7) edema from prolonged labor; (8) rigidity.

In multiparæ, who have been properly repaired, it is common for the perineal body to give way, in subsequent labors, but re-injuries of the levator are much less common.

Symptoms of a Perineal Tear.—Tears of the first degree, involving for a short distance only the central perineal body, often cause no symptoms at all.

Tears involving the levator ani cause the following: (1) Sense of loss of support, "as if everything were dropping out;" (2) this sensation is aggravated by standing or exertion, and at the menstrual periods; (3) backache; (4) often the protrusion of a rectocele, referred to usually by the patient as "falling of the womb;" (5) if a rectocele is present, the patient often has difficulty in defecation.

All these symptoms are much more marked if there is an associated retroversion; even extensive tears may cause very slight symptoms if there is no backward displacement of the uterus.

Diagnosis.—The patient is placed across the bed, in the dorsal position. (2) She is asked to strain, when the degree of gaping of the labia is noted. (3) After careful cleansing of the vulva, the labia are separated, when any obvious tear can be

seen. (4) The thickness of the perineal body is palpated by one gloved finger in the vagina and the thumb outside, on the perineum. This will disclose injury to the bulbocavernosus, superficial and deep transversus perinei muscles. (5) The levator ani is tested as follows: the forefinger is inserted in the vagina, up to the second joint, and pressed downward and outward, to note a cleft, if any, in the muscle. The forefinger is swept from one pubic ramus to the other, to note whether the muscle forms an unbroken horseshoe curve. With the forefinger in the vagina and the thumb outside, the thickness

FIG. 95.—Testing the levator ani muscle. The forefinger is inserted in the vagina up to the second joint; the thumb is midway between the tuberosity of the ischium and the anus.

of the levator is palpated. (6) The sphincter ani is always tested last, by feeling the complete circumference of the muscle with the forefinger in the rectum and the thumb outside. It is easy to overlook a submucous tear of the sphincter, and a serious mistake to do so. Mere inspection of the perineum is no guide to the extent of injury present.

Results of Lacerated Perineum.—(1) Rectocele; (2) hemorrhoids; (3) prolapse of the uterus.

Central Tear of the Perineum.—In very rigid perinei, when overdistended by the head, a circular perforation sometimes appears midway between the posterior commissure of the vulva and the anus. This should be at once opened through into the vagina by scissors, followed by a double episiotomy. Unless so treated, the head is likely to emerge from the rectum, with disastrous results to the sphincter.

Symptoms of Tear Through the Sphincter Ani (Complete Tear).—(1) Incontinence of gas and feces (which may mean

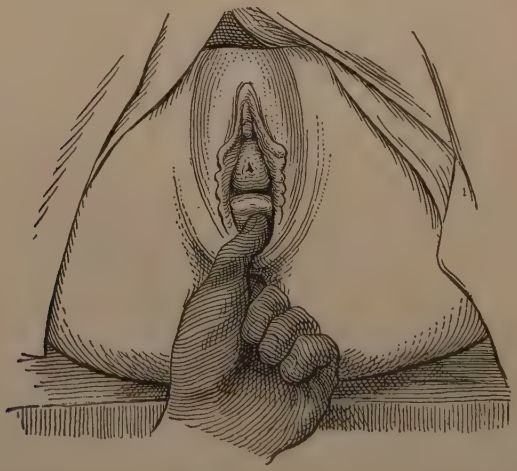

FIG. 96.—Testing the sphincter ani for laceration. (*After B. C. Hirst.*)

only overstretching of the sphincter); (2) the sphincter forms a slightly curved line across the posterior border of the anus; (3) its ends are marked by two visible dimples or pits; (4) the folds of skin, or rugæ, normally surrounding the anus are gone anteriorly and deepened posteriorly; (5) if the sphincter be palpated with one finger in the rectum, the gap in the ring muscle can be felt plainly.

Time of Repair.—The *immediate repair* directly after labor of the perineum is not advised, for the following reasons: (1) Accuracy of diagnosis is impossible; (2) the bruised and edema-

tous tissues are not good material for repair; (3) the danger of infection is very much greater; (4) these repairs are often only the closure of the perineal skin, with entire disregard of the muscular injuries; (5) failure is common, necessitating a second operation later. Above all does this apply to operations for complete tear of the sphincter ani.

All these disadvantages can be obviated by repair on the seventh day after delivery, unless the patient has fever, in which case the repair is postponed until the temperature has been normal for a week. With ordinary care, sepsis is not to be feared, and objections based upon supposed difficulty or unfavorable healing are not based upon fact.

Treatment

Preventive.—Avoidance of undue haste in delivery; protection of the perineum by retarding the head; lack of haste in forceps delivery; using small forceps (Hale-Sawyer) whenever possible; episiotomy when indicated; avoidance of large doses or indiscriminate use of pituitrin. By observance of these details, many, but by no means all, lacerations can be avoided or at least limited in extent.

Technic of Repair.—*Immediate:* No matter what the physician's preference may be, this should never be undertaken if the vulva and vagina are badly bruised; if there is reason to believe that there is beginning infection; if the patient is excessively exhausted or if she is an eclamptic; or if the laceration dates from a previous labor. It is not advisable to place the sutures before the placenta is delivered, and the old practice, recently revived, of putting sutures in the perineum before delivery of the head, and removing them, if not needed, after delivery, is absurd. Anesthesia is said not to be needed, because the overstretched tissues are not sensitive. The patient's actions, while the repair is in progress, will often cause the physician grave doubts as to the accuracy of this statement.

Technic of Immediate Repair.—(1) The patient is arranged

across the bed, with her feet on two chairs, and her hips over the edge of the bed.

2. The vulva is carefully cleansed with cotton and lysol solution (one dram to two pints).

3. If much blood is trickling down from above, a large gauze or cotton sponge may be inserted in the vagina, against the cervix, and *removed after the stitches are in place, but before they are tied.*

4. The labia are separated and the extent of the injury inspected. This is materially aided by retraction of the anterior vaginal wall by an assistant.

5. Visible open tears of the levator may be sutured with a continuous number 1 chromic catgut stitch.

6. The perineal body is repaired by interrupted stitches of number 3 chromic catgut or silkworm-gut, placed so that the entire depth of the tear is included, and not the skin of the perineum only.

Episiotomy wounds are sutured in the same way. Plain catgut is not to be used, as it disappears too soon. Silk has the disadvantage of cutting through the tissues. The after-care of these repairs is as described under the delayed repair of the perineum. The silkworm-gut sutures are removed on the twelfth day. The catgut ones will disappear spontaneously. The sphincter ani may be repaired immediately, if torn, but much better results are attained by delaying the repair for at least a week. If the repair is undertaken at once, it is done as described in the delayed repair.

Technic of the Delayed Repair of the Perineum.—*Preparation for Operation:* Day before operation: 4 P.M. Shave pubes completely. 9 P.M. Magnesium sulphate ½ ounce, or citrate of magnesia, flat, 8 ounces.

Day of Operation.—Early in the morning, cup of beef tea, no other breakfast. Clear lower bowel out thoroughly by repeated enemas, so that last enema is given at least two hours before operation. Continue enemas until water returns clear. Two hours before operation give paregoric 1½ teaspoonfuls.

This inhibits peristalsis much better than morphin. Catheterize just before etherization.

Do not give hypodermic of morphin and atropin. The paregoric takes its place.

Local preparation done on the table, by careful and complete scrubbing of vulva and vagina by cotton pledgets and tincture of green soap and hot water.

Choice of Operation.—Of the multitude of operations described for perineorrhaphy, there are three that answer all

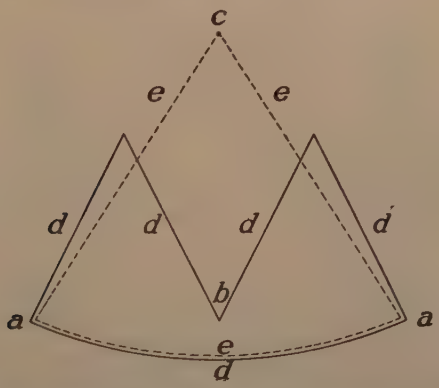

FIG. 97.—The Emmet and Hegar denudations compared. *a*, Lowest myrtiform caruncle, the same in both operations; *b*, tip of rectocele; *c*, highest point in Hegar operation on posterior vaginal wall; *d*, lines of Emmet denudation; *e*, lines of Hegar denudation. The solid lines show the shape of the Emmet denudation; the dotted lines that of the Hegar.

requirements, provided the special indications of each are considered.

(1) The Emmet operation, satisfactory in moderate tears, *with slight rectocele*, but unsatisfactory if the rectocele is large and worthless in prolapse of the uterus; (2) the Hegar operation, of value in large rectocele and prolapse, but unnecessarily extensive in moderate tears; (3) the B. C. Hirst anatomical restoration, designed to repair the various muscles in the lines of their original injuries. It is done with the Em-

met denudation if there is not much rectocele; though the Hegar denudation if there is.

The Emmet operation denudes the lateral vaginal sulci separately and repairs them; the Hegar makes one large central triangular denudation and joins the levator of one side to the levator of the other, above the rectum which is crowded back in the process. Hence the Hegar operation overcorrects and narrows the vagina; the Emmet does not.

Emmet Operation.—(1) The patient is in the dorsal position,

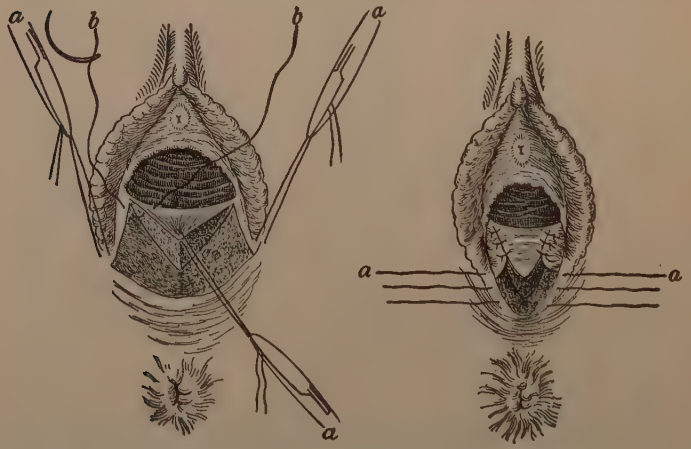

FIG. 98.—The Emmet perineorrhaphy. (*After Stewart.*)

the vagina carefully cleansed with tincture of green soap, hot water and lysol solution.

2. As nearly all lochial discharge contains pathogenic organisms, the uterus should be washed out with lysol solution, and a large pledget of cotton soaked in lysol solution placed against the cervix. This must always be removed as soon as the operation is completed. In secondary operations, long after childbirth, this step is of course omitted.

3. Each labium is caught with a bullet forceps just below the lowest myrtiform caruncle (above which is the duct of

Bartholin's gland) or more conveniently the labia are separated with the Gelpi self-retaining perineal retractor.

4. The tip of the rectocele is caught with a volsellum (the

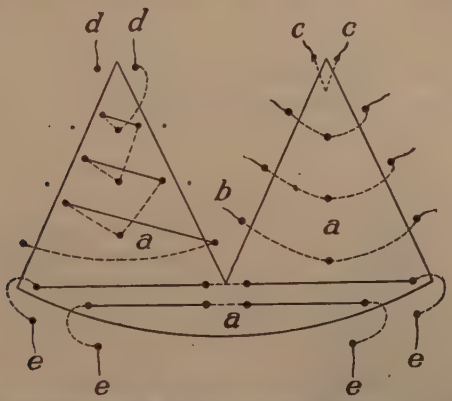

FIG. 99.—Diagram of the Emmet perineal repair. *a*, Denuded area; *b*, area not denuded; *c*, interrupted stitches in sulcus; *d*, continuous stitches in sulcus; *e*, crown stitches.

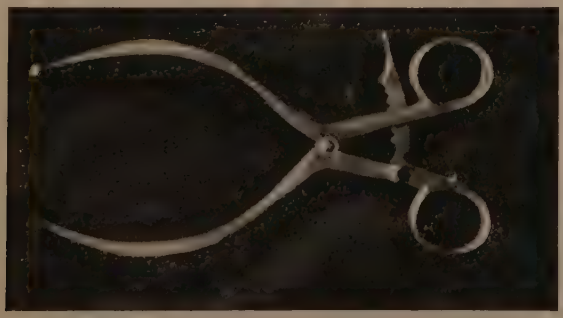

FIG. 100.—The Gelpi self-retaining perineal retractor, for use in plastic operations. It is especially useful where one has only one assistant.

tip is the portion nearest the cervix, in the midline, which *without tension* can be brought down to the posterior commissure of the vulva).

5. The lateral sulci are denuded in one piece or in strips.

6. The central perineal triangle is denuded, and if any granulation tissue is present, it is curetted off with the edge of a knife.

7. The lateral sulcus wounds are closed by continuous or interrupted sutures of number 1 chromic catgut, or interrupted sutures of silkworm-gut. Catgut stitches are tied, silkworm-gut are secured with perforated shot, as it makes their removal easier.

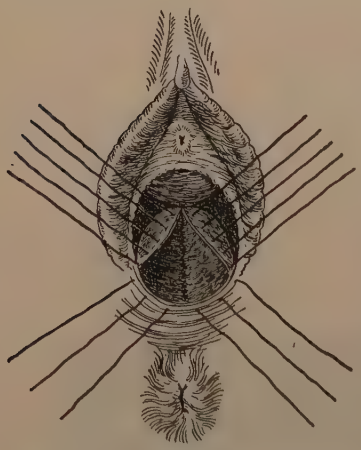

Fig. 101.—The Hegar perineorrhaphy.

8. The crown stitches of number 1 chromic catgut or silkworm-gut are inserted. The stitch passes through one labium, just below the tenaculum, emerges in the sulcus just below the last sulcus stitch, transfixes the tip of the rectocele, and passes through the other labium to emerge on the skin perineum, just opposite its point of insertion. Two or three of these stitches are required. They are tied from above downward, after all are inserted.

9. The vagina is douched and packed with sterile gauze.

Hegar Operation.—(1) The patient is prepared as for the Emmet operation.

2. The labia are caught, as in the Emmet operation.

3. A point in the middle of the posterior vaginal wall, about two-thirds of the way from the vulva to cervix, is caught with a volsellum.

4. The large single triangle formed by these three instruments is denuded, care being taken to avoid wounding the rectum, an accident likely to occur unless great care is exercised. Any granulation tissue in the area to be denuded is curetted off.

5. Transverse interrupted stitches are placed across this triangle from the apex downward. The upper ones may be of number 3 chromic catgut, the lower three vaginal and the perineal stitches should be silkworm-gut, because they are under considerable tension.

6. The perineal stitches are placed, beginning with the one nearest the anus, so as to close the wound in the perineal body,

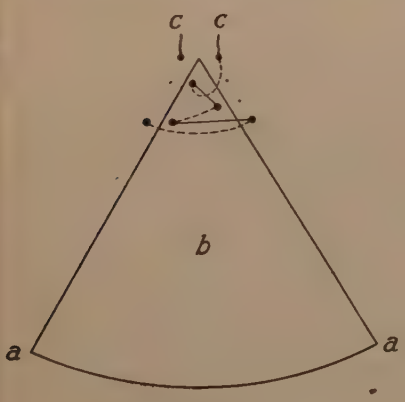

FIG. 102.

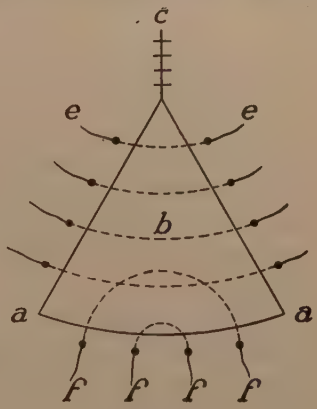

FIG. 103.

FIG. 102.—Denudation in the Hegar operation, and suture of the rectocele above the levator ani. *a*, Myrtiform caruncles; *b*, denuded area; everything included in triangle is denuded; *c*, stitch puckering up tip of triangle.

FIG. 103.—Hegar operation, second stage. *a*, Myrtiform caruncles; *b*, denuded area; *c*, puckered up tip of triangle; *e*, interrupted stitches of levator ani; *f*, interrupted suture of perineal body.

entering from and emerging in the perineal skin, and are tied from above downward.

7. The vagina is douched and packed with sterile gauze. The Hegar operation disregards the normal perineal anatomy and its injuries but is a satisfactory operation in the cases where it is indicated.

Technic of the B. C. Hirst Perineorrhaphy.—(1) The patient is prepared as for the Emmet operation.

2. The labia and tip of the rectocele are caught as in the Emmet operation.

3. The sulci and central triangles are denuded as in the Emmet operation.

4. The fascia covering the levator ani is incised, on each side, in a line parallel to and just beneath the edge of the sulcus denudation.

5. The tear in the levator ani is closed on each side, inside the sheath of the muscle, by a continuous stitch of number 1 chromic catgut.

6. Two interrupted stitches are placed through the sheath and end of the deep transversus perinei muscle, but are not tied. The stitches pass through the sheath and muscle of one side, pick up the perineal body floor in the middle line, between the anterior and posterior layers of the triangular ligament, and through the sheath and muscle of the other side.

7. The posterior layer of the triangular ligament is closed over the bulging rectum, it being through the tear in the ligament that the rectocele protrudes.

8. The lateral sulci are closed in the Emmet operation, by a continuous stitch.

9. The tip of the rectocele is fastened down to the posterior column of the vagina, inside the posterior commissure of the vulva, where it originally belongs.

10. The tension of the Gelpi retractor is relaxed, and the two stitches securing the deep transversus perinei are tied.

11. The tears of Colles fascia, bulbocavernosus, superficial transversus perinei and anterior layer of the triangular ligament, all in the perineal body, are closed by interrupted stitches placed so that, when tied, the knots will be covered in when the perineal skin is closed.

12. The perineal skin is closed.

13. The vagina is douched and packed with sterile gauze.

All catgut used is number 1 chromic catgut, of forty-day durability, except in the skin sutures, where overchromicized

number 1 gut, of greater durability, is used. This operation is designed to correct the lacerations in the planes in which they occur, and to effect a normal anatomical restoration.

No perineal operation should be attempted from a written description. For its understanding, actual demonstrations are necessary. It is not usually advisable in recent injuries to put in any vaginal packing, as it tends to dam back the lochia. This applies only to operations done immediately after delivery or early in the puerperium.

Routine After-care of Plastics.—(1) Morphin sulph. gr. $\frac{1}{6}$, atropin sulph. gr. $\frac{1}{150}$ 6th hour p.r.n.; (2) water p.r.n. first twenty-four hours; (3) irrigate perineal stitches with sterile water four times daily, and also after each urination or bowel movement, and keep sterile vulvar pad in place after irrigation; (4) inspect stitches frequently; if stitches are soiled, clean with cotton on applicator and peroxid of hydrogen. Moderate cutting may be disregarded; (5) vaginal douche sterile water every day after fifth day; (6) simple enema once or twice in second twenty-four hours; (7) end forty-eight hours, calomel gr. $\frac{1}{6}$ every hour for six doses followed, 2 hours after the last dose by *flat* magnesium citrate, 6 ounces; (8) soft diet after first twenty-four hours, light diet fifth day, full diet seventh day; (9) catheterize 8th hour p.r.n.; (10) *take out vaginal packing in twenty-four hours, if any is inserted, and note its removal on the chart;* (11) as a routine laxative use compound cathartic pills, one at bed time. If too active, give only half a pill. If these cause griping, use A. B. S. and C. pill.

Operation for Complete Tear.—Repair of a complete tear should never be attempted as long as there is any edema, sloughing, unhealthy granulation, or fever. Failure is sure if this precaution is disregarded. If a complete, or any other perineal tear, shows sloughing or edema, restoration to healthy condition is more quickly attained by thrice daily douches of hot sterile water, and application of weak solutions of nitrate of silver (gr. 10 to oz. 1) to any place showing persistent false

membrane. These precautions are necessary in the puerperium only.

Preparation for repair of complete tear is the same as any plastic operation, except that several days must be devoted to getting the bowels to move freely, before the operation is attempted.

Technic.—(1) The patient is arranged and cleansed as for any plastic operation.

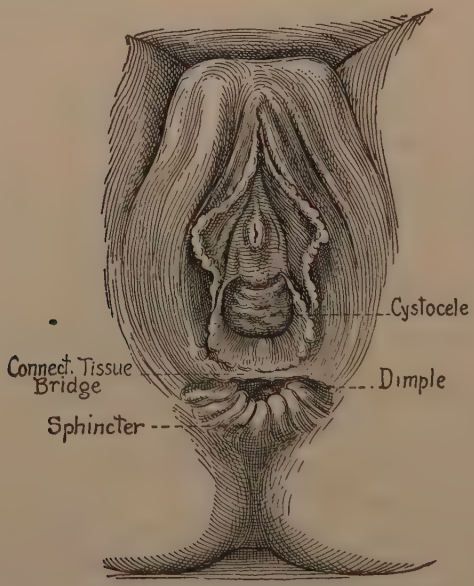

FIG. 104.—A typical complete tear of the perineum through the sphincter ani. (*After Graves.*)

2. The sphincter is stretched by grasping between the thumbs and forefingers, and stretched for a full minute.

3. The labia and tip of the rectocele are caught as in the Emmet operation.

4. An incision is made from one sphincter pit, around the tear in the rectovaginal septum, to the other sphincter pit.

5. The rectovaginal septum is split, between the vagina and

rectum, so as to secure an ample margin of raw tissue, without sacrifice of any unnecessary portion.

6. The tear in the rectovaginal septum is repaired by inter-

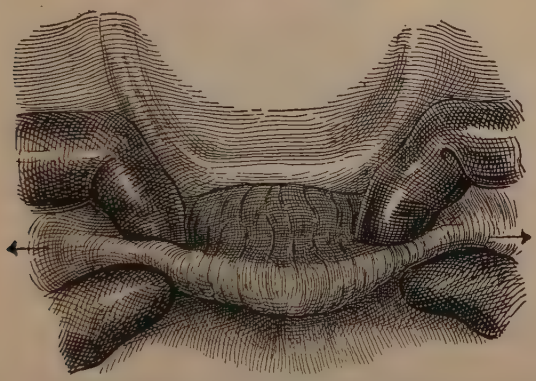

FIG. 105.—Arrows indicate direction of traction. Stretching the sphincter ani in a complete tear operation.

rupted silkworm-gut stitches, put in from the rectal side, so that the knots, when tied, will be in the rectum.

Interrupted chromic catgut stitches with the knots buried

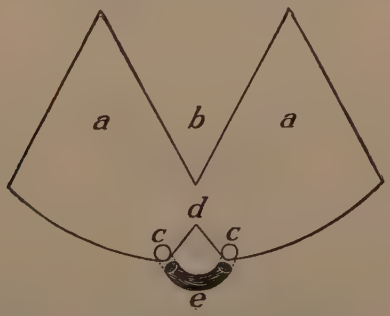

FIG. 106.—Diagram for complete tear operation. *a*, Lateral sulci in vagina (denuded); *b*, rectocele (not denuded); *c*, sphincter pits; the empty ends of the sphincter sheath; *d*, tip of tear in rectovaginal septum; *e*, sphincter ani, retracted in its sheath.

in the perineal body may be used, but with a greater likelihood of perineal fistula.

7. The ends of the sphincter are pulled out of the pits into which they had retracted, by single tenacula, and cleared

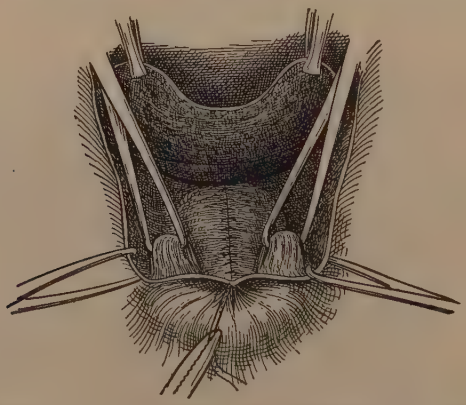

FIG. 107.—Bringing up the ends of the sphincter ani. The ends of the muscle are retracted in the sheath, ¼ to ½ inch below the surface of the denudation. (*After Crossen.*)

of any granulation tissue which may cover them. The sphincter may be recognized by palpation, noting that the tissue

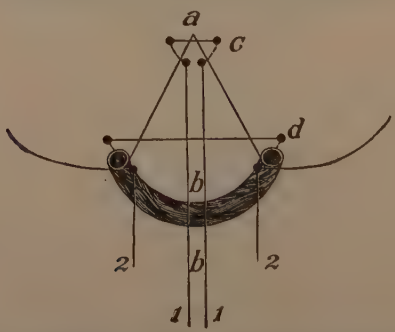

FIG. 108.—The stitches of the complete tear operation. *a*, The tip of the tear in the rectovaginal septum; *b*, the sphincter ani; *c*, denuded area around the tear in the rectovaginal septum; *d*, end of sphincter, dug out of its pit. 1. Interrupted suture closing apex of tear in rectovaginal septum. 2. Interrupted suture, through sphincter and sheath. Only one of each kind is shown.

pulled up by the tenacula is continuous with the buried

part of the muscle, and also by the yellowish-red color of the exposed ends. This color is a very marked contrast to the much deeper red of the surrounding denudation. Two interrupted stitches of number 1 chromic catgut are passed through the ends of the muscle, so that when tied the knots will be buried in the perineal body. These are for approximation *only*. Two silkworm-gut stitches are next passed through the sphincter and sheath, beginning at the mucocutaneous junction at the anus on one side, and emerging at a corresponding point on the opposite side.

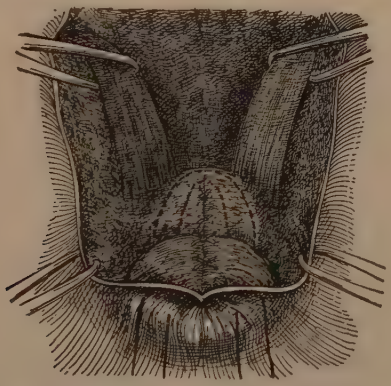

FIG. 109.—The sphincter repaired. (*After Crossen.*)

These are for approximation and tension. With this plan, further tension stitches are unnecessary.

8. All the rectal stitches are tied from above downward.

9. The rest of the perineal injury is repaired as may be required by the extent of the tear, disregarding the rectal feature of the tear. In complete tears it is common for the levator to escape injury, and the tear is confined to the perineal body in the middle line.

After-treatment is the same as any plastic except for the care of the bowels. Much the safest plan is to keep the bowels liquid from the start, usually either magnesium citrate (flat), or Carlsbad water and Sprudel salts (one dram to the tumbler

of water). Either of these is used quantities varying in each case, but sufficient to give two liquid movements a day. This plan is much safer than keeping the bowels locked, and infection is not to be feared. The stitches are removed on the sixteenth day, best in the knee-chest posture through a rectal speculum, cautiously opened; and the bowels must be kept liquid for at least a month and soft for two or three months thereafter. The commonest cause of failure, next to infection, is neglect of the bowels.

Infection is likely to result in either complete failure, or rectovaginal or rectoperineal fistulæ. These latter rarely if ever heal spontaneously, and must be closed by a second operation.

In this or any other plastic it is unnecessary to keep the knees bound together, unless the patient is unruly or delirious, and she may turn on either side after twenty-four hours.

Factors Essential to Success in Complete Tear Operations.—(1) Choice of proper time and condition for operations; (2) stretching of the sphincter; (3) exposure and cleansing of granulation tissue from ends of sphincter; (4) permanent suture material (silkworm-gut); (5) pass sutures deep enough to catch sheath of sphincter; (6) leave stitches in at least sixteen days; (7) keep bowels liquid from start; (8) avoid constipation after the stitches are removed.

If the bowels should be locked, the first movement must be secured under oil enemata, and in all probability breaking up of the fecal mass by the gloved finger, inserted in the anus and morcellating the mass by pushing back toward the sacrum and *never* forward.

With proper management, and, if necessary, timely episiotomy, a repaired sphincter will usually withstand subsequent delivery without giving way.

Time in Bed.—Silkworm-gut sutures in the operation for incomplete tears are removed on the twelfth day, the patient gets up on the fourteenth day and goes home on the seventeenth day. In complete tears, the stitches are removed on the six-

teenth day, the patient gets up on the eighteenth day and goes home on the twenty-first day.

It has seemed, to the author, advisable to consider the subject of lacerations of the birth canal from the obstetrical viewpoint of the recent injury as well as the gynecological one of delayed repair. In no other way can a complete grasp of the subject be gained.

CHAPTER XIII

PATHOLOGICAL SEQUELÆ OF CHILDBIRTH

While many of the conditions herein described can occur from other causes, childbirth is responsible for them in the vast majority of cases, and hence this classification is used for convenience.

The commonest pathologic sequelæ of childbirth, injuriously affecting a patient's health, are:

(1) Lacerations of the birth canal; (2) retroversion of the uterus; (3) pelvic inflammation. These three account for a large proportion of the ailments for which women consult their physicians. The other sequelæ, not arranged in order of frequency are: (4) erosion of the cervix; (5) diastasis of the recti; (6) floating kidney; (7) fractured coccyx; (8) incontinence of urine; (9) relaxed sacro-iliac joints; (10) rectocele; (11) cystocele; (12) prolapse of the uterus; (13) genital fistulæ.

1. Lacerations of the birth canal have been described in Chapter XII.

2. Retroversion of the uterus has been described in Chapter VII.

3. Pelvic inflammation has been described in Chapter VIII.

4. Erosion of the cervix has been described in Chapter VI.

5. Diastasis of the recti has been described in Chapter XI.

VI. FLOATING KIDNEY

Cause.—(1) Loss of supporting fatty capsule; (2) drag on kidney by movable cecum or colon; (3) secondarily only, the relaxation of the lower abdomen by the distention of pregnancy.

Symptoms.—In most cases, symptoms are absent. Only a small percentage (5–8 per cent.) require any relief. A dull

dragging pain in the loin (nearly always the right) associated with a "sense of looseness" in the corresponding side of the abdomen. The discomfort is not transmitted down the ureter, as it is likely to be in stone. Sudden, sharp attacks of pain, due to the twist in the ureter with temporary hydronephrosis, are common. Often a large quantity of urine is passed, following such an attack of pain. The severity of the symptoms does not depend upon the degree of looseness, and coincident appendicitis is frequent, due to congestion on the appendiceal

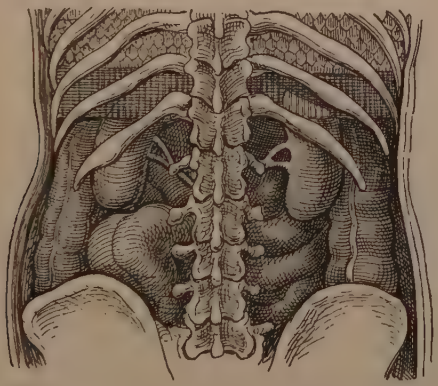

FIG. 110.—The normal relation of the kidneys, seen from behind.

veins by pressure of the kidney on the mesenteric veins (Edebohls).

Diagnosis.—The patient is arranged flat on her back, with knees flexed on the abdomen. It is impossible, except in thin individuals, to feel the normally placed kidney.

The left hand is placed flat under the left flank, and pressed upward, while the right hand makes counter pressure on the abdomen, just below the costal margin. The patient takes a deep breath and then exhales quickly. The smooth, elastic body of the kidney is unmistakable. As the kidney is often low, the examination should extend as far down as the pelvic brim. In doubtful cases, the pelvis of the kidney may be injected and an *x*-ray will show its position. Pyelography is

not entirely safe, however, as extensive penetration of the silver salt into the parenchyma of the kidney will sometimes occur.

Treatment is only required when definite symptoms demand relief. Muscular exercise, full diet and a properly fitting abdominal binder, with a pad, will relieve the moderate cases. Where Dietl's crises of pain occur however, or in very low and very movable kidneys, operation is required. The principle is decapsulation of the kidney, with suspension by stitches through the capsule against the cut edge of the quadratus lumborum, outside the erector spinæ, just below the last rib. The kidney should not be fixed too high, above the last rib, as

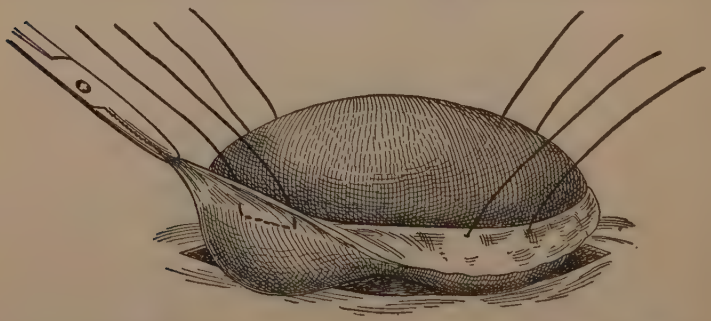

FIG. 111.—Nephrorrhaphy. Shows the method of passing the fixation sutures. (*Ashton, after Edebohls.*)

it is likely to rotate over the points of support. The kidney thus fixed, is always palpable, and the patient should be informed of this fact, to avoid errors of diagnosis in any future examination.

Technic of Edebohls' Suspension of Kidney.—(1) The skin of the back is prepared in the same way as the abdomen for section.

2. The patient is arranged lying on the abdomen, with a cylindrical air cushion under her upper abdomen.

3. An incision is made parallel to the outer border of the erector spinæ muscles, about three inches long.

4. The deep fascia is cut through and the fatty capsule of the kidney exposed.

5. By grasping the capsule with forceps, the kidney is gradually coaxed out of the wound. In this step the patient's body will often have to be pulled up or down over the air cushion, to bring the kidney into the wound.

6. The kidney should never be turned transversely to hold it in place in the wound, but is left as it emerges, parallel to the axis of the wound.

7. The capsule is split in the middle line from pole to pole and is dissected back laterally, so the kidney is completely decapsulated.

8. Four stitches of number 3 chromic catgut (40-day) are passed through the capsule, one at each corner, taking multiple bites to prevent tearing out. The ends are left long and caught in hemostats.

9. The air cushion is deflated and the kidney returned to its bed at the bottom of the wound.

10. The ends of the stitches in the capsule are rethreaded in needles and passed through the muscle at each side of the wound, so that raw edge of muscle is turned against the decapsulated surface of the kidney. They are then tied down snugly.

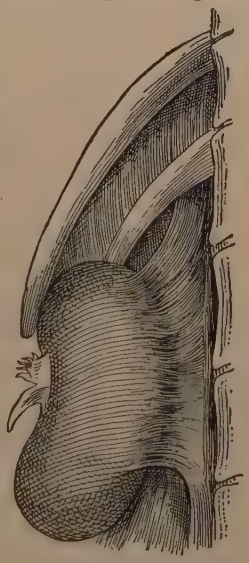

FIG. 112.—The type of adhesion and the position of the kidney (upper pole at the last rib) as secured by the Edebohls' nephrorrhaphy. (*After Edebohls.*)

11. Three interrupted stitches of number 3 (40-day) chromic catgut are used to bring the muscle edges together over the kidney to prevent hernia.

12. The fascia, fat and skin are closed as in any wound. The wound is dressed with gauze and collodion and adhesive straps.

13. The patient is kept in bed for three weeks, but need be off her back only for the first twenty-four hours.

Dystopic kidney is the congenitally low kidney, at, near

or even below the pelvic brim. The vessels come from the internal iliacs, and the ureter is short, hence the reposition to its normal position is impossible. Diagnosis can be made definitely by catheterizing the ureters with *x*-ray catheters and *x*-ray picture. The condition is of no importance except in labor, but should be excluded before any attempt at reposition of the kidney is made.

VII. FRACTURE OF THE COCCYX

Fractured coccyx is most common in justominor pelves, especially where forceps have been used, and in elderly primiparæ. The injury may occur spontaneously. It is most commonly a rupture of the joint between the first and second pieces of the coccyx.

Mechanism.—The mechanism of a fracture of the coccyx, resulting in permanent mobility, is first a fall, where the coccyx is driven in the pelvic canal, rupturing the posterior longitudinal ligament, and causing the coccyx to project much further than normal into the pelvic canal. In labor, the head pushes the coccyx in the opposite direction, causing a rupture of the anterior longitudinal ligament, and a separation of the joint between the first and second pieces.

Terminations.—(1) The coccyx may ankylose inward (into the pelvic canal) when spontaneous cure results, until the next labor breaks it again; (2) ankylosis backward, in a straight line, so that the patient sits upon the tip of it, like a nail; (3) permanent painful mobility, *coccygodynia*—much the commonest. The first requires no treatment, the others require removal of the bone.

Causes of Coccygeal Pain.—Pain is not always due to injury of the bone. The causes of coccygeal pain are: (1) Injury; (2) reflex (from retroversion of the uterus); (3) rheumatic; (4) neurotic.

It should be an invariable rule *never* to remove the coccyx unless injury can be demonstrated.

Symptoms of Painful Mobility.—(1) The patient complains

of pain, at the end of the spine, on walking, sitting or particularly on defecation; (2) she has difficulty on arising from a chair; (3) she sits on one buttock, and cannot remain long in one position.

Diagnosis.—With the patient in the Sims' (left lateral) posture, one forefinger, protected by a fingercot or glove, is inserted in the rectum and the coccyx grasped between this finger and the thumb outside. There is always normal anteroposterior motion of about 1.5 cm. If the coccyx can be moved laterally; if the movement causes pain, and if by pres-

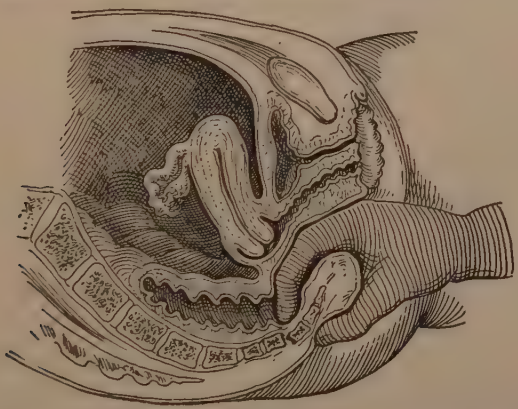

FIG. 113.—Testing the coccyx for fracture by separating the fragments. (*After B. C. Hirst.*)

sure a step can be made between the upper and lower fragments, the bone is injured. *X*-ray does not show the injury.

Treatment.—At least six months after labor should be allowed, for possible spontaneous ankylosis. A mild ointment (1 per cent. or 2 per cent. iodin) may be used externally over the bone, chiefly as a placebo. If spontaneous cure is not effected, or if the coccyx ankyloses backward, its removal is indicated. The coccyx is exposed by an incision over it, as far from the anus as possible. The bone is dissected loose from its attachments with scissors, care being taken not to wound the rectum, which is close underneath. The dissection is carried

above the lateral alæ on the first piece of the coccyx, and the bone amputated with a Gigli saw between these alæ and the tubercles marking the last piece of the sacrum. It is important that *all* the coccyx be removed; amputation through the ruptured joint will not relieve the symptoms. The median sacral artery is tied, the deep wound drained with a few strands of silkworm-gut (horsehair drain) and closed with interrupted stitches of silkworm-gut, so that all dead space is obliterated. Serious or even fatal infection may result if the wound is improperly closed. It is dressed with gauze and collodion, and kept as clean as possible. The stitches are removed in two weeks.

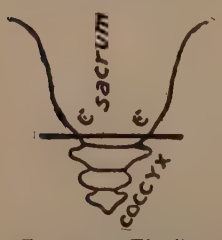

FIG. 114.—The line of amputation in coccygectomy. The last piece of the sacrum has tubercles but no lateral alæ; the first piece of the coccyx has lateral alæ but no tubercles. The line of amputation lies between them.

For some weeks the patient will have to sit on an air cushion, as the wound is exceedingly tender. A horseshoe-shaped cushion is best, and is used with the open end at the back. The wound, during convalescence, is exceedingly difficult to keep clean, and frequently suppurates. It is not necessary nor advisable, in this case, to remove the stitches, as the wound can be flushed through the drainage tract and *between* the stitches, twice daily, with Dakin's fluid, which is much the best for irrigation. To remove the stitches for infection retards healing for many weeks.

VIII. RELAXATION OF THE SACRO-ILIAC JOINTS

This is a common consequence of childbirth, but may also occur from any sudden jar or strain. The condition is described in Chapter XII.

IX. RECTOCELE

Rectocele is caused by a bulging forward of the anterior wall of the rectum, covered by the posterior vaginal wall, through a tear in the fascia between the levator and deep

transversus perinei muscles, and the triangular ligament. The patient will usually mistake the condition for prolapse of the uterus, and will complain of difficulty in defecation, due to the column of feces being diverted from its normal path.

Diagnosis.—With the patient in the dorsal position, the labia are separated, and she is asked to strain. The bulging forward of the rectocele is obvious.

Treatment.—Proper repair of the perineal floor and body, as described under lacerations of the birth canal, is the proper treatment. In all cases where the rectocele is marked, the Hegar shape of denudation is better than the Emmet.

A common cause of recurrence of a rectocele, after even a properly performed plastic operation, is chronic constipation and the consequent forward push of the column of fecal matter, with the patient's straining efforts. It is vital to the success of a plastic operation that constipation be prevented, and this should be done by laxatives. Merely emptying the lower bowel by enema is not sufficient.

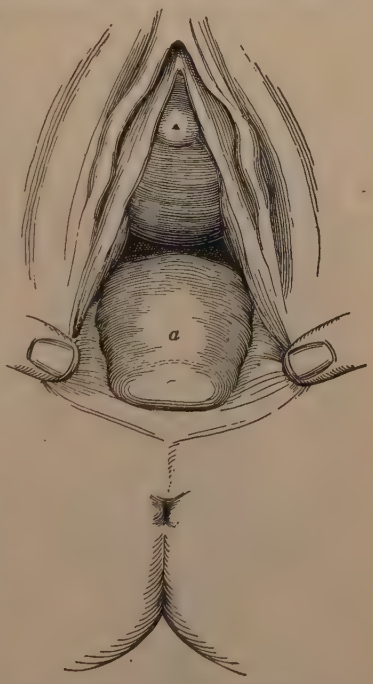

FIG. 115.—An old laceration of the perineum in both sulci. Rectocele. The mouth of the vagina is held open to show the appearance of the parts before operation: *a*, Apex of the rectocele. (*Penrose.*)

X. CYSTOCELE

Cystocele is a bulging downward of the bladder, and anterior vaginal wall.

Causes.—(1) Laceration of the muscle of the urogenital trigonum; (2) diastasis of the anterior vaginal fascia; (3) elongation of the uterovesical and cardinal ligaments.

While a cystocele often develops after spontaneous delivery, the most important predisposing cause of a cystocele is traction by forceps, particularly axis-traction forceps, before the head has passed through the cervix, and improper direction of pull on the forceps at any stage (outward instead of *downward* until the head is under the pubic arch). The injury often does not appear until several months or even many years after labor. Its proper correction in all cases is one of the as yet unsolved problems of gynecology.

FIG. 116.—Rectocele and cystocele. (*Penrose.*)

Cystocele may occur in nulliparous women or even virgins, but except as a consequence of childbirth it is exceedingly rare. It is always associated with some degree of prolapse, and in procidentia, the greatest part of the protruding mass is the cystocele.

Mechanism. — Cystocele usually begins in the upper part of the anterior vaginal wall, near the cervical attachment. As a result of intra-abdominal pressure, in the erect posture the vaginal wall is gradually dragged away from its attachment to the pubic rami, and the anterior vaginal wall first appears at the vulvar orifice and later bulges through it. Occasionally only the anterior third of the vaginal wall is involved, and in this case the moderate protrusion is called *urethrocele.* This is to be distinguished from the hypertrophy

of the suburethral vaginal mucosa, often seen as a result of pregnancy.

Symptoms.—(1) The patient complains of some protrusion from the vulva, which she is likely to call the uterus; (2) vesical irritation, from decomposition of residual urine, in the pouch below the urethra.

Diagnosis.—With the patient in the dorsal position, the labia separated, she is asked to strain. The protrusion of the anterior vaginal wall is very obvious. It is not advisable to test the position of the bladder by the insertion through the urethra of a sound. There is great danger of injury to the vesical mucosa and consequent ulcer. A suburethral abscess, from Skene's glands, looks not unlike a cystocele, but the absence of bulging on straining, the brawny feel and pus oozing from the urethra should make the diagnosis easy.

FIG. 117.—Globe pessary with stem. (*B. C. Hirst.*)

Treatment.—Palliative by the globe, ball-and-stem, air-cushion ring, Menge, Schatz, or Gehrung pessaries. The palliative treatment is never curative, and is simply a crutch, and is indicated in those cases only where operation is inadvisable or impossible.

1. The globe pessary is a hard rubber ball, inserted in the vagina and held in place partly by its size and partly by a protective napkin worn by the patient. It has the advantage of simplicity, but is likely to be forced out if the patient strains.

2. The ball-and-stem pessary is a hard rubber ball on a stem, which in turn is held in place by an abdominal belt with perineal straps. It is efficient, but is a cumbersome harness and usually objectionable to the patient.

3. The soft rubber air-cushion, either singly or as the Hewitt

triple ring should never be used. It becomes very foul after a short residence, and there is considerable danger of sepsis.

4. The Schatz door-knob pessary is simple and efficient. It is shaped exactly like a door knob, and is inserted with the

FIG. 118.—Different forms of the ring pessary for prolapse or cystocele. Unsatisfactory because they usually turn sideways and drop out.

knob against the cervix. The shank of the pessary keeps the knob transverse in the vagina, and hence the pessary does not drop out. It completely fills the vagina, and makes coitus impossible.

FIG. 119.—Schatz's door-knob pessary for prolapse of the uterus. Not quite so efficient as the Menge, but based upon the same principle.

5. The Menge pessary is similar in principle to the Schatz, except that the bulb forming the shank of the pessary is detachable, to facilitate removal. It is very efficient, but also fills the vagina completely.

6. The Gehrung pessary consists of two horseshoe-shaped

arches joined at their heels. It is inserted so that the heels of the arch are laterally pressing against the remains of the pelvic floor, and the keystone of the arch up against the bladder. It is fairly efficient, as long as it does not change its position, which it is very prone to do.

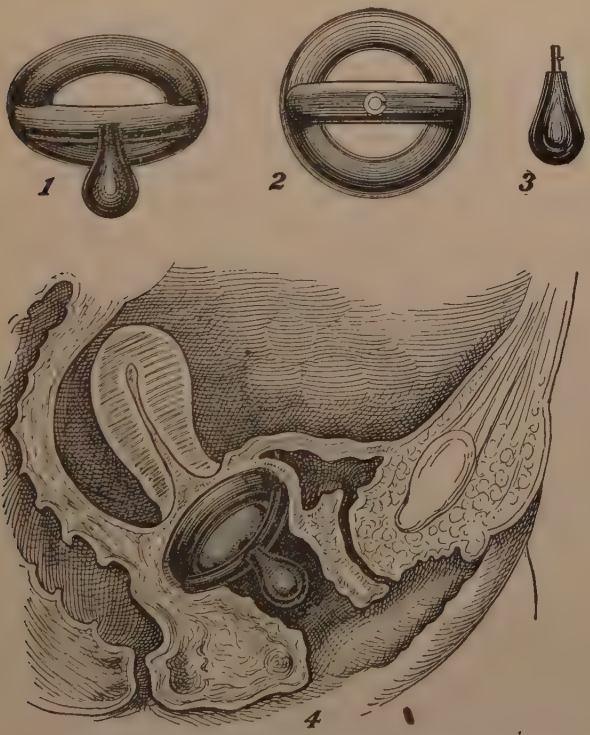

FIG. 120.—The Menge pessary for prolapse. Showing its position when inserted.

The Menge and Schatz pessaries are the best. They must be removed every six to eight weeks, the vagina inspected for erosion and if none be found, the pessary is cleaned and re-inserted. Usually after some months there has been some contraction of tissue, so that a smaller pessary than the one

at first used can be inserted. If any erosion occurs, the pessary must be left out for several weeks and the patient takes a daily douche of normal salt solution. After the erosion has disappeared, the pessary can be reinserted. In the average case, erosion will occur about twice a year; more frequently the older the patient.

These directions apply to some degree to all pessaries, but particularly to the Schatz, Menge and Gehrung.

Operative Treatment.—A great number of operations have been devised, but there is no single operation applicable to all cases. The age of the patient, the degree of cystocele, and the method of its production must be considered.

1. The Stoltz purse-string operation is applicable *only* to small cystoceles, and particularly to urethrocele. It is

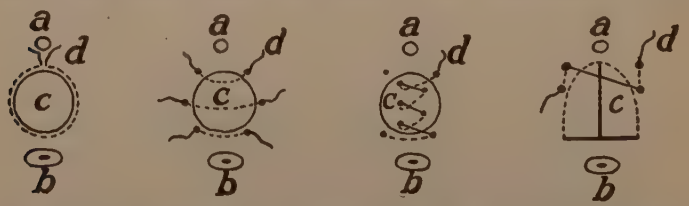

FIG. 121.—Operations for cystocele. From left to right: 1. Stoltz purse string operation. 2. Old oval denudation. 3. Martin operation. 4. B. C. Hirst operation. *a*, Urethra; *b*, cervix; *c*, denuded area; *d*, stitch.

an archaic method, but fairly effective. The technic is denudation of a circular space covering the arch of the cystocele and a purse-string suture of number 2 chromic forty-day gut is then placed around this, taking care that the needle does not penetrate the bladder.

2. The Martin operation is efficient, except in large cystoceles. An oval denudation is made, covering the area of the cystocele, and with a running stitch of number 2 chromic forty-day catgut, the denuded area is gradually obliterated, with several tiers of stitches. If this denudation is carried out far enough laterally to expose the retracted fascia, the results are very satisfactory.

3. The Hirst (B. C.) operation is valuable, also in moderate cases. The cervix is caught and pulled down. A longitudinal incision is made from the base of the urethra to the cervico-vaginal attachment, and a transverse incision across the cervix, so the shape of the incision is an upside down T. The anterior vaginal mucosa is dissected away from the bladder, until the lateral fascia is exposed. The uterovesical ligament is cut and the bladder pushed up. The lateral fascia is then brought together in the middle line, using interrupted stitches of number 3 chromic catgut. The excess of mucosa is cut off and the vaginal flaps closed. Interrupted stitches are better than continuous, as the latter causes too snug a closure and favors development of a hematoma.

4. The Goffe operation is like the preceding until the bladder is dissected free and the uterovesical ligament cut. Then a retractor is placed under the bladder, the peritoneal pouch caught and opened, and the bladder suspended to each uterine cornu and the uterine fundus with stitches of linen thread. The peritoneum is closed and the vaginal wound repaired.

5. The Watkins-Freund-Wertheim operation of interposition of the uterus under the bladder, by opening the anterior vaginal vault is the surest cure, but is not usually done where any further childbearing is to be expected, unless the patient is artificially sterilized, by resection of the Fallopian tubes at the uterine cornu. It is the only method to be depended upon in very large cystoceles, particularly those occurring very soon after delivery by axis-traction forceps.

Technic.—(1) The bladder is dissected free and the peritoneum opened as just described in the Goffe operation.

2. The uterine body is caught with a tenaculum and gently pulled through the peritoneal opening.

3. A stout curved needle, with number 3 chromic catgut catches the lateral fascia near the urethra, the fundus uteri between the tubes and the lateral fascia on the other side.

4. Four or five similar stitches are inserted, gradually approaching the cervix.

5. The bladder is pushed back, over the fundus, and the stitches tied from above downward. This fixes the uterus under the bladder, in a position of extreme anteflexion.

6. The excess mucosa is trimmed off and the vaginal wound closed.

7. In all interposition operations the convalescence is marred by some degree of bladder irritation or actual

FIG. 122.—The position of the uterus and its relation to the bladder after the Watkins-Wertheim operation of interposition. (*After Crossen.*)

cystitis. This can be minimized by the routine use of urotropin, 10 grains four times daily, for the first three days after the operation.

Permanent suture material is not desirable, as a sinus frequently results. These patients have difficulty in urination for a time, and have to be catheterized. They often have menorrhagia, for many periods afterward, but usually the excess flow is not great. In spite of these drawbacks, the operation gives good results, when future childbearing is not to be expected.

6. The author has used, for some years, with great satisfac-

tion, a variation of the above technic by which the uppermost uterine stitch grasps the uterus at the junction of the middle and upper thirds, so that the uterus with the lateral vaginal fascia forms a shelf on which the bladder rests, but is not anteflexed. Several patients, on whom this was done have passed through subsequent childbirth, without dystocia and without recurrence of the cystocele, and he has, in 141 cases, seen no primary failures.

7. In very severe cases, recurring after other methods, it may be necessary to open the abdomen and sew the bladder fan-shaped to the anterior abdominal walls.

By one of these methods, practically any case can be managed.

XI. PROLAPSE OF THE UTERUS

While the great majority of cases result from the injuries of childbirth, there are other causes: (1) Sudden severe muscular effort; (2) constant muscular shocks (as in a chronic cough); (3) rupture of an ovarian cyst (the weight of the fluid in the lower abdomen acting as a mechanical cause).

Too early rising after labor, with the resumption of hard work, associated with unrepaired lacerations is the commonest cause of prolapse; a predisposing factor is forceps delivery through a partially dilated or partly effaced cervix, axis-traction forceps, or improper direction of pull in any forceps operation.

Degrees of prolapse are named from the position of the cervix; such as: Prolapse with cervix on the pelvic floor, or at the outlet. Any prolapse in which the cervix or rest of the uterus is outside the vulvar orifice is called total prolapse or *procidentia uteri.*

Mechanism.—(1) Laceration of the pelvic floor, allowing the uterus to sag until its ligaments become suspensory; (2) retroversion of the uterus, until its axis coincides with that of the vagina; (3) descent of the uterus by stretching of the uterosacral ligaments and the vaginal attachments to the pubic rami.

Symptoms.—(1) Loss of support, felt worst toward evening, when the patient has been on her feet all day; relieved by rest in bed; (2) complaint of protrusion through the labia of the cervix or other portion of the uterus (depending upon the degree of prolapse). The degree of prolapse is named from the position occupied by the cervix, when the patient is in the erect

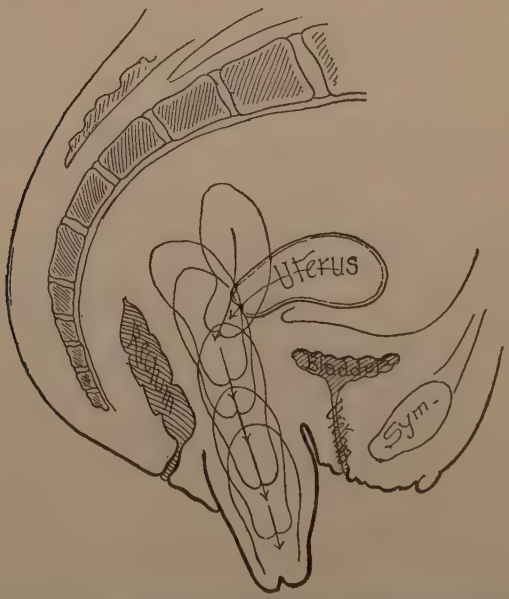

FIG. 123.—The different stages of prolapse of the uterus. (*After Kelly.*)

posture. A prolapse in which the cervix or uterine body emerges from the vulva, is called complete, or *procidentia uteri.*

Diagnosis is easy. The cervix, or more of the uterus, is seen to protrude between the labia. It is important not to make an examination when the patient has been some time in bed or just after the removal of a pessary, as the true degree of prolapse may not be apparent. Cystocele is always marked, and usually forms the greater part of the protruding mass. The

vaginal mucosa is usually thickened and rough, and may be the site of extensive ulceration, especially near the cervix.

Treatment.—Palliative treatment is indicated only when operation is inadvisable. It is never curative and while it gives immense relief, patients must be made to understand that they must be constantly under supervision. Occasionally, after the menopause, the genital atrophy will effect a

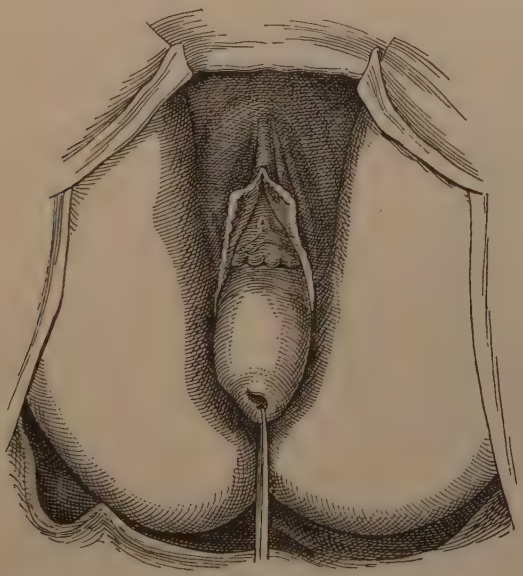

FIG. 124.—Prolapse of the uterus. The cervix is pulled down by a double tenaculum on the posterior lip. (*After B. C. Hirst.*)

spontaneous cure, but this is never to be expected. Usually prolapse gets worse after the menopause.

The palliative treatment consists in support by a pessary, the same as used in cystocele. The Schatz and Menge are much the best in prolapse, and their use here is exactly the same as in cystocele.

Operative Treatment. 1. *Preparatory.*—Most cases require no preparatory treatment, but often, as a result of constant

exposure, friction of the thighs clothing and irritation by urine and perspiration, the vaginal mucosa is the seat of extensive ulcers. These must be healed, before any operation is undertaken.

1. The patient is kept off her feet.

2. The uterus is replaced and held in place by tampons with 25 per cent. boroglycerid.

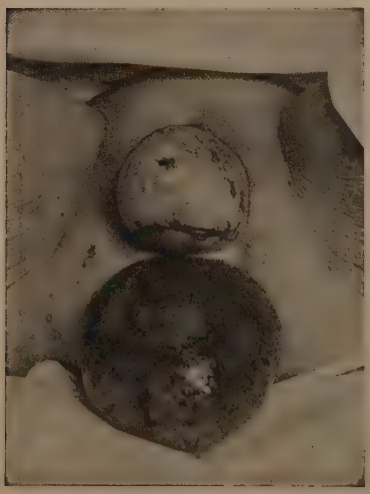

FIG. 125.—Prolapse of the uterus and rectum. (*Author's case, Philadelphia General Hospital.*)

3. The ulcers are painted with 20 grains to the ounce nitrate of silver solution, three times a week.

4. The patient takes twice daily in the interval between tampons, a vaginal douche of hot normal salt solution. Under this treatment, the ulcers disappear in four to six weeks.

Irreducible prolapse is the name given when the uterus has been so long prolapsed that it is congested, swollen and cannot easily be replaced. It can be managed, however, by (1) knee-chest posture; (2) wrapping the protruding mass in towels, wrung out of very hot water; (3) pressure to reduce engorgement; (4) taxis, upward, like in incarcerated hernia.

Operation.—The best method is that which does not do too much violence to the normal anatomy and leaves the patient in as normal a condition as possible.

The following technic has given excellent results:

1. The patient is arranged as for a plastic operation, in the dorsal position.

2. The cervix is caught with double tenacula and pulled down.

3. The cervix is amputated, by the Hegar technic.

4. The cervical canal is dilated and the uterine cavity curetted. This is done *after* amputation, because the cervix is usually too long for effective dilatation.

FIG. 126.—Prolapse of uterus and bladder. Notice that the bulk of the protruding mass is cystocele.

5. A Watkins-Freund operation is done for the cystocele.

6. An extensive Hegar perineorrhaphy is done.

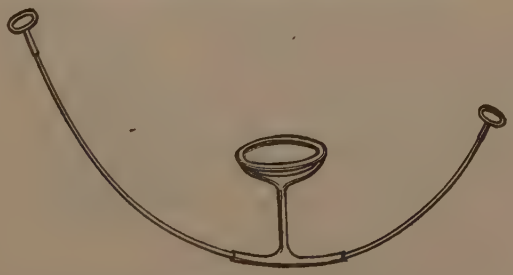

FIG. 127.—The Goddard pessary for prolapse, cheap and efficient, but requires a bandage around the waist for support.

No abdominal operation is necessary for prolapse. The cystocele operation eliminates retroversion, and the plastic work, properly done, is ample for support.

A common mistake is to perform vaginal or abdominal

hysterectomy. This should *never* be done unless there is uterine carcinoma and should then be followed by extensive plastic work on the anterior and posterior vaginal walls, to prevent inversion of the vagina, which will surely follow if this be neglected. Neither vaginal hysterectomy nor ventrofixation of the uterus will alone cure prolapse of the uterus, unless combined with extensive vaginal repair.

Most operations for prolapse are done at an age when further

FIG. 128.—Complete inversion of the vagina, following vaginal hysterectomy for prolapse of the uterus. (*Author's case, St. Agnes Hospital.*)

childbearing is unlikely. In young women, however, laceration is likely to recur at any future delivery, but proper repair at that time will usually prevent any recurrence of the prolapse. In most cases of prolapse in women in the childbearing age, it is desirable that no further pregnancy occur.

This can be managed by resection of the tubes at the uterine cornua, during the cystocele operation, and hysterectomy is an unnecessarily radical method.

XII. INCONTINENCE OF URINE

Incontinence of urine is due to (1) Paralysis of the vesical sphincter; (2) overflow from retention; (3) laceration of the urogenital muscle (compressor urethræ); (4) fistula; (5) pull upon the vesical neck by a retroverted uterus.

The **symptoms** are obvious. There is a leakage of urine, either constantly or upon any exertion.

The **diagnosis** of the cause may be difficult. The incontinence of the overflow is easily overcome by the catheter (soft rubber or silk and *not* glass). That due to fistula can be managed only by the closure of the fistula. Incontinence only upon sudden muscular effort is almost always due to laceration of the muscle of the urogenital trigonum, the repair of which will be found described in the chapter on the injuries of the birth canal. Retroversion is diagnosed by manual examination. If none of these causes are responsible, the cause is paralysis of the vesical sphincter. Moderate cases tend to recover spontaneously. Cases of long standing are exceedingly difficult to treat. Large doses of strychnin (grain $\frac{1}{20}$ four times a day) over a long period and the slow interrupted faradic current, one pole in the urethra and the other on the abdomen, applied for 45 minutes every day will often hasten a cure. If a reasonable trial fails, injections of paraffin (melting point 110°F.) are often successful. The injection is made in the tissues between the anterior vaginal wall and the vesical neck, and is dumb-bell shaped, with the transverse bar across the vesical neck. The effect is that due to slight pressure. The paraffin can be removed at any time, by incision and enucleation, and this should be done in the event of future pregnancy, as the pressure of the child's head on the mass of paraffin might be disastrous to the bladder. In otherwise intractable cases, surgical methods are (1)

shortening the vesical sphincter; (2) extensive cystocele operation; (3) interposition operation. They should be tried in this order.

XIII. GENITAL FISTULÆ

The causes of genital fistulæ are: (1) Sloughing from continued pressure in obstructed labor—now becoming rare, due to better management; (2) lacerations from violent delivery or slipping forceps; (3) abscess; (4) tuberculosis; (5) syphilis; (6) cancer— in its later stages.

Kinds.—A long list of fistulæ may be made by connecting in every possible way the bladder, vagina, rectum, ureter

FIG. 129.—Fistulæ of the genital organs: *a*, Vesico-uterine fistula; *b*, vesicocervical fistula; *c*, vesicovaginal fistula; *d*, urethrovaginal fistula; *e*, rectovaginal fistula; *f*, perineovaginal fistula. (*Beigel.*)

intestine, uterus and urethra. By far the commonest are, in order: (1) Vesicovaginal; (2) rectovaginal; (3) ureterovaginal; (4) vesico-cervico-vaginal.

Diagnosis of Vesicovaginal Fistula.—The patient complains of constant dribbling of urine; usually excoriation of the labia and thighs, and, if the fistula is of long standing, cicatricial

contractions of the vagina. In very small fistulæ there may be leakage only in certain positions, or when the bladder is full. Almost always there is a complicating cystitis. The demonstration of a fistula may not be easy. Large ones can usually be seen at once, but a small fistula may be so hidden by a fold of the vaginal mucosa, that it is difficult or impossible to see it. If the fistula cannot be seen (usually near the cervix and toward one vaginal vault) when the vagina is expanded by a bivalve speculum, other means of diagnosis must be used. (1) Searching with a probe—a rather clumsy method; (2) cystoscopy, as the bladder end of the fistula is usually easier to see, and a probe or ureteral catheter can then be passed through it; (3) injection into the bladder of colored fluid, when its point of leakage can be seen. The best fluid is sterile milk, and four ounces is enough. If the fistula is so small that leakage only occurs in the erect posture, the bladder may be injected with 2 per cent. methylene blue solution, small pledgets of cotton placed in the vaginal vaults and the patient allowed to walk about for a few minutes. The pledget of cotton marking the site of the fistula will be stained blue. By these injections, incontinence due to paralysis of the vesical sphincter may be excluded.

Treatment of Vesicovaginal Fistula.—No attempt should be made to repair the fistula until puerperal involution is complete. Two or three months after labor is the most favorable time. Very small fistulæ may sometimes be made to heal by cauterization with nitric acid or a red-hot probe or electric needle. This method is not usually safe, as it may cause the fistula to enlarge instead of heal. Usually, the steps of repair are: (1) For at least a week before operation, the bladder should be flushed with boric acid solution, twice daily.

2. For the operation, the patient is anesthetized, placed in the dorsal (or Sims) position, and prepared locally as for a plastic.

3. The fistula is located, and denudation is made around it, down to but *not through* the vesical mucosa.

4. The edge of the fistula is split, so as to separate it from the anterior vaginal wall.

5. The bladder wall is closed with interrupted number 1 chromic catgut or linen thread stitches.

6. The vaginal mucosa and fascia is closed over the bladder wall by interrupted stitches of linen thread. The denudation should be so planned that as little tension on the stitches as possible will result.

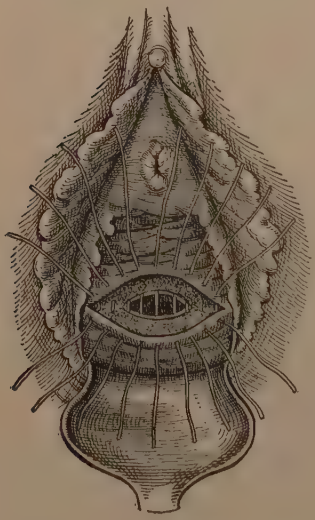

FIG. 130.

FIG. 131.

FIG. 130.—The simplest form of operation for vesicovaginal fistula.
FIG. 131.—The flap-splitting operation for vesicovaginal fistula.

7. The bladder is kept from overflowing by a permanent mushroom catheter, or better by catheterization every four hours, as the permanent catheter is likely to cause troublesome cystitis.

The linen stitches are removed in two weeks. Complete success is not common at the first trial, and re-operations are frequent. If the vagina is the seat of cicatricial contraction, the bands must be cut, the vagina dilated with glass

plugs and the normal elasticity restored as far as possible, before any repair is attempted. Syphilitic, tubercular and cancerous fistulæ should not be touched surgically, as they are impossible to repair. Very large fistulæ, so large that no flaps can be made by dissection and undermining of the edges may be treated in one of two ways. (1) Opening the anterior vaginal vault, anteverting the uterus, and sewing the uterine body, as a plug, in the opening in the bladder; (2) complete closure of the vagina—*colpocleisis*—so that the bladder and vagina form one cavity. This is so often followed by ascending infection of the ureters, pyelonephrosis and fatal sepsis, that its use seems unjustifiable.

Diagnosis of Rectovaginal Fistulæ.—The patient complains of passing fecal matter and gas through the vagina. The same symptoms seem to occur in tear of the sphincter, and the patient is unable to distinguish between them. The fistula is usually easy to see, and is most often just inside the vagina or on the perineum. Milk may be injected and its point of exit noted.

Treatment of Rectovaginal Fistulæ.—Repair is much easier and more certain of success than in vesical fistula. An oval denudation is made around the fistula down to but not including the rectal mucosa. The edge of the fistula is split, to separate the rectal wall. The opening in the rectum in closed with number 1 chromic catgut, interrupted stitches, and the vaginal wall closed over it. The bowels are kept loose from the start, two movements a day being required. Before any attempt is made to close an apparent rectovaginal fistula, *anus vestibularis* must be excluded. In these cases the anus opens just inside the vaginal orifice, and has all the appearance of a fistula.

A little care in diagnosis will prevent this mistake. Here also syphilitic, tubercular and cancerous fistulæ cannot be repaired.

Diagnosis of Ureterovaginal Fistulæ.—Constant dribbling of urine, irrespective of the patient's position, but in amounts

smaller than would be expected from a vesicovaginal fistula. No opening from the bladder can be found, but the fistula, or at least the source of the urine, can usually be seen in one vaginal vault. These fistulæ are most common after high forceps deliveries, or in rapid delivery of a breech or in version. Such a history may help in directing attention to the site of the fistula. If the fistula cannot be seen, a hypodermic injection of indigo-carmine (2 mils) is given. Then by placing cotton pledgets near the supposed site, the blue stain on the cotton will serve to locate it.

Treatment of Ureterovaginal Fistulæ.—Either implantation of the ureter into the bladder by the vaginal route—colpo-ureterocystostomy, or by the abdominal route—laparo-ureterocystostomy. Implantation of the ureter in the bowel is likely to cause ascending infection and pyelitis and is not desirable if it can be avoided.

Vesicocervicovaginal fistula, from violence in forceps deliveries or too rapid extraction of the child after version or in a breech presentation, is one of the most difficult of fistulæ to treat. The urine can be seen emerging from the cervix. The only way to close the opening is to dissect the anterior vaginal wall from the bladder, free the bladder by cutting the utero-vesical ligaments, and closing the fistula in the bladder, which is thus exposed, by interrupted sutures of linen thread. It is, fortunately, rare.

It is difficult to lay down any set rules for operation for a condition in which each case is a separate problem. The method of closing genital fistulæ must be adapted to the needs of the individual case. The foregoing is merely an outline of typical cases.

CHAPTER XIV

DISEASES OF THE URINARY TRACT INCLUDING CYSTOSCOPY

General Anatomy.—The kidney is essentially the same, in its anatomical relations, in both sexes.

The *ureter* in the female is wider than in the male; it runs retroperitoneally to the pelvic brim, crosses the common iliac just before the internal iliac branches off; dives into the pelvis and passes through the base of the broad ligament, near the cervix, and thence into the base of the bladder, to empty into the trigone. The uterine arteries lie in close relationship with the ureter, crossing in front at the level of the internal os. The left ureter lies much closer to the cervix than the right; and both ureters lie much closer than normal to the cervix when the uterus is prolapsed or pulled down.

The *bladder* is broader than in the male, its normal capacity is less, and its walls thinner. It is much more dilatable than the male, and lies deeper in the pelvis. The fundus and upper portion of the anterior wall are covered by peritoneum, the posterior wall is not.

The *trigone* is a triangular space formed by lines drawn between the ureteral orifices and the urethra. Between the ureters runs a slightly raised band in the bladder wall, called the interureteric fold, which is of great value in locating the ureteral orifices in cystoscopy.

The *urethra* is short, of large caliber, very dilatable and is lined with pavement epithelium in its lower, cylindrical in its upper portion. In the floor lie Skene's glands.

The *blood-supply* of the bladder and urethra comes from the internal pudic, inferior vesical and in part from the uterine arteries.

The *veins* empty into the vesicovaginal plexus.

The *nerves* are from the pudic.

The *lymphatics* empty into the deep hypogastric and inguinal glands.

Technic of examination of the female urinary tract. (1) *Catheterization* is often necessary to collect urine uncontaminated by admixture of vaginal secretions. There is great danger of cystitis unless it is carefully done. A satisfactory technic is as follows:

1. Catheters must be thoroughly cleaned *after* using and boiled before being put away.

2. Catheters must be boiled for ten minutes just before use.

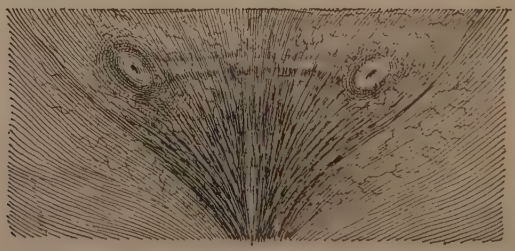

FIG. 132.—The trigone of the bladder with the ureteral orifices and the interureteric fold.

3. Use soft rubber catheters, and *not* metal or glass ones.

4. Get ready 1 small basin lysol solution (2 drams to 1 pint), 1 small basin sterile water; sterile cotton; sterile gloves. At night have candle or flashlight. Use catheter from basin and water in which it has been boiled, and do not handle except with gloves.

5. Have patient arranged on her back, knees drawn up and separated. Use two fingers of gloved hand to separate labia and expose urethral orifice. *With other gloved hand*, wipe off urethral orifice with cotton and lysol solution, followed by sterile water.

6. Pick up catheter, lubricate end with sterile albolene, and insert gently.

7. When bladder is emptied, withdraw catheter, and wipe off urethral orifice again with cotton and lysol solution, followed by sterile water.

8. Always have light enough to see, and *never* trust to feeling for the urethra.

9. Cleanse catheter *after* using and always boil before putting away.

10. Failure to observe these precautions may result in serious disability to a patient. There is *no excuse* for a patient's developing inflammation of the bladder after the use of the catheter.

CYSTOSCOPY

Cystoscopy is done by two methods: (1) Water distention of the bladder; (2) air distention.

The method of air distention is clumsy and inconvenient. It requires an exaggerated Trendelenburg or the knee-chest posture, and is of use only when there is so much pus in the bladder that a clear fluid for vision is not obtainable. The instrument used is the Kelly open channel cystoscope, requiring reflected light from a head light or mirror, and the view obtained is limited and unsatisfactory.

Water distention is much more desirable. It does not require anesthesia, can be done as a routine office procedure, and rarely gives the patient more than passing discomfort. A very satisfactory instrument is the Brown-Buerger special, with a wide visual field. With this cystoscope it is just possible to see both ureteral orifices in the same field. Directions for its use are as follows:

1. Patient in lithotomy position, no ether.

2. Cleanse urethral orifice, and if very small, use small urethral sound (22).

3. Have cystoscope, cord and catheters sterilized by formalin vapor. If wiped off with alcohol, never get it or any other fluid on the eyepiece.

4. Easiest to use examining lens first to locate ureters, and

then change to catheterizing lens. This only in the older models with limited field of vision.

5. Lubricate *light* of scope *only*, never get anything on lens, and use only glycerin or water soluble lubricant.

FIG. 133.—Sterilizing plant for cystoscopes and catheters. Loose formaldehyd powder in bottom of jar. Efficient and inexpensive.

6. Insert cystoscope, turn upside down (except in direct vision scopes), attach irrigating tube, and light cord.

7. Allow water to run in bladder, until patient feels desire to urinate, then cut off and turn light on slowly. *Too little water in bladder is the commonest cause of trouble.*

8. Always work with as little light turned on as possible. Lights are easily burned out and are expensive.

9. If fluid is cloudy, let water run in and out until clear.

10. Look for ureters by turning cystoscope at angle of 45 degrees to perpendicular on each side of bladder. If a doubtful spot is seen and you cannot be sure whether it is the ureter, watch it for a few seconds. If it is a ureter, it will spout urine. Where the ureteral orifices are difficult to find, it is a good plan to inject into the patient's thigh one mil of indigo-carmine. After about twelve minutes both kidneys will begin to excrete the color, and the spurts of blue urine from the ureters makes their detection easy.

11. When finished with examining lens, turn light off,

remove cystoscope, change to catheterizing lens, insert catheters and proceed as before to insert cystoscope and find the ureters. Only in instruments of limited field.

12. To catheterize ureter, when located, focus it at about 5 o'clock (right) or 7 o'clock (left) using the field as a clock face. Push catheter down till visible past lens. Guide it in proper direction with the hinged flap worked from the handle of scope and push in mouth of ureter. When in, put flap down flat again and then push catheter up to pelvis of kidney.

13. To push catheter in, grasp it with fingers as near where it enters the cystoscope channel as possible, and push in by very short steps. Otherwise it will bend.

14. *Never* catheterize a *healthy* ureter from an *infected* bladder.

15. To wash out pelvis of kidney use a Luer glass or Ricord syringe and boric acid solution and then hegonon 1 per cent. or silvol 5 per cent. The pelvis of the kidney should hold 10 to 15 c.c. but be guided by patient's complaint of pain, and never persist after pain starts, and never force the fluid through the catheter.

16. To remove cystoscope turn off light, disconnect water tube, *be sure guiding flap is flat down* and remove.

17. To leave catheters in, push up as far as possible, allowing them to curl up in bladder. Leave only ½ inch of catheter beyond eyepiece of cystoscope. Then remove cystoscope as in number 16. When catheters appear at urethral orifice, hold them and pull cystoscope away from them. Fix them to thighs with adhesive tape, let drain into bottles and be sure before removing the cystoscope that you know which is right and which left.

18. After using, dry cystoscope with gauze, dry catheters by wiping off and keep them with stylets in them. The stylets should be German silver and not steel wire, or the latter rusts badly. *Never* get any moisture in the eyepiece of the scope. This end is *not* watertight.

19. After any case of ureteral catheterization, there is liable

to be severe pain, of short duration, from the passage of a blood-clot down the ureter. The pain simulates stone, is short lived, but may require morphin hypodermically to relieve it.

20. Injections into ureter, of antiseptic solution, are most useful in pyelitis. The most satisfactory are silvol, 5–10 per cent., argyrol 25 per cent., protargol 2 per cent., hegonon 1 per cent. and boric acid solution gr. 10 to oz. 1. All injections are made slowly and discontinued as soon as the patient complains of discomfort in the back.

USES OF URETERAL CATHETER

(1) To collect urine from the kidneys separately; (2) diagnosis of stricture; (3) diagnosis of stone; (4) irrigate pelvis of kidney; (5) *x*-ray picture; (6) to locate the ureter, in operation for cancer.

SEGREGATION OF URINE

In cases where it is impossible or inadvisable to catheterize the ureters, urine may be collected from each side of the bladder separately by segregation. The Harris instrument is a double bar inserted in the bladder, separated, and the vaginal and bladder walls pushed up between the ends, by a third bar in the vagina, so as to make a watershed. The urine is then removed by suction with a syringe. The Cathelin or Luys instruments use a water-tight rubber diaphragm for the same purpose. Segregation is not as good as ureteral catheterization and should not be used when the latter is practicable.

PYELOGRAPHY

Pyelography, or the injection into the pelvis of the kidney of a solution opaque to the *x*-ray, and then taking an *x*-ray picture, is of great value in diagnosis of position and hydronephrosis, but is not without danger, as the solution will sometimes penetrate into the renal parenchyma or cause necrosis and suppuration. The best solutions are: (1) thorium nitrate 5 per cent.; (2) collargol 10 per cent.; (3) argentide emulsion.

The amount used varies from 5 to 20 c.c., depending upon the capacity of the kidney pelvis, and no force must be used in the injections. When the pelvis is full, the patient feels some discomfort in her back, the injection is stopped and the *x*-ray taken at once.

DISEASES OF THE URINARY TRACT

I. Diseases of the Kidney

PYELITIS

Pyelitis is a bacterial infection of the mucosa of the pelvis of the kidney. There are two avenues of infection: (1) hematogenous, through the circulation; (2) ascending infection from the bladder, along the ureter. The first is much the commonest.

Bacteria.—(1) Bacillus aërogenes mycosum (of the colon bacillus group); (2) colon bacillus; (3) pneumococcus; (4) staphylococcus; (5) streptococcus; (6) gonococcus.

In chronic cases the colon bacillus or Bacillus aërogenes mycosum are present in pure culture; in acute cases staphylococci, pneumococci and streptococci are commonly found.

Causes.—*Predisposing causes* are the tendency to hydroureter and hydronephrosis due to a movable kidney or direct pressure on the ureter against the pelvic brim.

Actual Causes.—(1) Widespread sepsis, postoperative; (2) stone; (3) puerperal infections; (4) cystitis and retention of urine. In many cases no exciting cause can be demonstrated.

Symptoms.—*Acute Cases*: (1) Chills and high fever; (2) leukocytosis; 18,000–24,000; (3) pain in loin, referred down ureter; (4) pyuria.

Chronic form persists after an acute attack, but more commonly is subacute or chronic from the beginning.

(1) Pyuria; (2) sensitiveness to pressure in kidney region. (3) pain referred intermittently along ureter; (4) moderate leukocytosis; (5) irritability of the bladder. Acute pyelitis is a dangerous and sometimes a fatal infection; chronic pyelitis may persist for years with very moderate symptoms.

Site.—It is most commonly unilateral, and on the right side. It may affect either side, however, and is occasionally bilateral.

Urine Examination.—The amount of albumin in the urine is at first in direct ratio to the amount of pus present; a greatly increased amount of albumin shows pyelonephritis with involvement of the parenchyma. Casts are not present in simple pyelitis.

Functional tests for excretion of urine, in simple pyelitis, show little difference in the two sides. Where the parenchyma of the kidney is invaded, however, that side always shows retarded function.

(1) *Indigo-carmine.*—If 1 mil of indigo-carmine is injected in the thigh, blue urine should be seen, through the cystoscope, to emerge from the ureters in about twelve and a half minutes. Delay usually indicates improper function, though exceptions are numerous.

Phenolsulphonphthalein.—Two to 4 mils of phenolsulphonphthalein are injected deep in the patient's thigh. She is catheterized immediately before the injection; again in one hour and ten minutes and again in one hour. The last two specimens are saved. Their color is compared with that in the colorimeter vials. About 60 per cent. is the normal excretion in two hours. Less indicates improper function, although wide variations are seen.

Diagnosis is easy. Cystoscopy will show the mouth of the affected ureter to be eroded, edematous, and cloudy urine can be seen to spout from it.

Causes of right-sided pain in women are: (1) Cholecystitis or gall-stones; (2) fecal impaction in hepatic flexure of colon; (3) floating kidney with hydronephrosis; (4) kidney stone; (5) ureteral stone; (6) pyelitis; (7) appendicitis; (8) salpingitis; (9) extra-uterine pregnancy; (10) ovarian cyst twisted on pedicle; (11) varicose veins in broad ligament.

Differential Diagnosis.—Pyelitis is commonly mistaken for chronic appendicitis, but urine examination and cystoscopy

should clear up the diagnosis at once. It is safer never to operate for chronic appendicitis in women, until pyelitis has been excluded.

Treatment.—*Palliative:* (1) Rest in bed, on side opposite the affected one; (2) ice bag to affected loin; (3) large amounts of water, twelve to fifteen glasses a day; (4) milk diet; (5) urinary antiseptics (salol, urotropin, helmitol gr. 10 every four hours; (6) bladder irrigations, to help ureteral peristalsis and aid drainage.

This usually causes rapid improvement in acute cases.

Radical.—Cystoscopy; catheterization of affected ureter, washing out of pelvis of kidney with boric acid solution, followed by 10 to 15 c.c. of 5 per cent. silvol solution, or 1 per cent. hegonon, or 25 per cent. argyrol. This, possibly repeated, will cure most cases. It can be done at once in chronic cases, but in acute ones is not advisable, due to the danger of pyelonephrosis.

Vaccine Treatment.—In chronic cases, which do not clear up with two or three irrigations of the pelvis of the kidney, the affected ureter should be catheterized, the exciting organism isolated and cultured and an autogenous vaccine made. Injections of this vaccine (100 million to the dose) will often give most brilliant results, and should always be tried in cases not responding to treatment. It is of value only in the chronic cases and does no good in the acute ones.

Surgical Treatment.—(1) Decapsulation of the kidney is illogical and does no good; (2) if pyelitis is due to stone in the pelvis, the stone must be removed; (3) nephrotomy for drainage is required for pyelonephrosis or (4) nephrectomy if the kidney is badly diseased or tubercular.

Prognosis.—A simple pyelitis will last for a long time without involving the kidney parenchyma, but may do so at any time. Most cases yield readily to irrigation of the pelvis of the kidney; unilateral cases have fewer complications than bilateral; a quiescent pyelitis is likely to be lighted up by pregnancy or pelvic operations.

STONE IN THE KIDNEY

Stone in the kidney gives the same symptoms in both sexes, though they are less frequent in women, and a discussion of their symptoms and treatment belongs in works on general surgery.

TUBERCULOSIS OF THE KIDNEY

This is of two types: (1) Ascending infection (more common in men); (2) descending infection (hematogenous) representing two-thirds of the cases and more common in women, and most often secondary to a lesion elsewhere, notably in the lung.

Symptoms are those of pyelitis and cystitis.

Diagnosis is made by cystoscopy, which shows a dilated, retracted ureteral orifice, usually with ulceration of the bladder wall around it. The affected ureter is catheterized and the urine secured is sedimented and examined for tubercle bacilli. In doubtful cases, a guinea-pig is injected (usually in the peritoneal cavity). The von Pirquet test is not positive proof.

Treatment.—If there is no active lesion elsewhere, and the disease is unilateral, nephrectomy with excision of the ureter, is necessary.

Prognosis is favorable if all the diseased tissue can be removed; unfavorable if there are active tubercular foci elsewhere.

HYPERNEPHROMA

Hypernephroma is the most frequent tumor of the kidney. Symptoms are (1) pain; (2) hematuria; (3) a tumor in the kidney region, movable and behind the colon.

It gives early metastases, to the lungs, liver and bones, is rapidly malignant.

Treatment.—Nephrectomy.

Prognosis doubtful, due to the frequency of metastases.

V. Floating Kidney

Floating kidney has been described under the sequelæ of childbirth (Chapter XIII).

II. Diseases of the Ureter

INFLAMMATION

Is always secondary to pyelitis or cystitis. There are two forms: (1) dilated—where the ureter is dilated and tortuous; (2) fibroid form where the ureter is thick, straight, and has numerous strictures.

Diagnosis.—(1) Symptoms of pyelitis or cystitis usually mask any from the ureter; (2) the thickened ureter can sometimes be palpated through the vaginal vault; (3) the cystoscope shows an eroded, red, pouting ureteral orifice, with cloudy urine issuing from it.

Treatment—is that of the causative pyelitis or cystitis.

STONE IN THE URETER

Stones in the ureter are renal calculi, small enough to enter the ureter and pass down it to the bladder.

Symptoms.—(1) Violent pain, referred into the pelvis; (2) blood and pus in the urine; (3) ureteral catheterization shows an obstruction; (4) *x*-ray will show the stone.

Treatment.—(1) During the acute attack hot fomentations to the affected side; (2) morphin hypodermically; (3) if complete obstruction to the flow of urine, immediate operation; (4) if the ureter is not completely blocked, cystoscopy with catheterization of the ureter and injection of sterile sweet oil; (3) if the oil does not dislodge the stone, operation with, if practicable, extraperitoneal incision of the ureter.

III. Diseases of the Bladder

CYSTITIS

Cystitis is caused by invasion of bacteria and their entry into the bladder wall through a break in the lining epithelium. The presence of bacteria in the urine does not mean cystitis, unless accompanied by the products of inflammation (leukocytes, ropy sediment and epithelium).

Routes of Infection.—(1) By the urethra, either by spontaneous ascending infection (possible theoretically at least) or much more likely catheterization; (2) hematogenous infec-

tion; (3) lymphatic infection; (4) fistula (vesicovaginal, vesico-intestinal or rupture of a cyst or pus tube).

Causes.—Predisposing causes are lowered resistance from: (1) cold; (2) physical exhaustion; (3) chronic pelvic congestion; (4) irritating drugs (cantharides); (5) ammoniacal urine, as in a cystocele.

Exciting Causes.—(1) Catheterization, either by a dirty catheter or by carrying organisms from the external genitalia into the bladder by means of the catheter; (2) injuries of the bladder in labor, or in operations, such as cystocele or hysterectomy; (3) foreign bodies, inserted accidentally or for masturbation; (4) infection through blood or lymph or by ascending urethral infection in cases of lowered resistance; (5) by descending infection from the kidney.

Kinds.—(1) Acute; (2) chronic.

Site of infection may be anywhere in the bladder; the trigone being the most and the vertex the least common situation.

Pathology.—1. *Acute Form:* (1) Mucosa red; (2) vessels enlarged and tortuous; (3) edema of the mucosa, with ecchymoses, most marked in the trigonum; (4) in the later stages, necrosis of the epithelium with ulcers, false membrane or extensive sloughs; (5) rarely gangrene with secondary shrinking in healing.

2. *Chronic Form.*—(1) Mucosa reddened in circumscribed areas; (2) vessels enlarged and tortuous; (3) edema of the trigonum; (4) epithelial proliferation with polypoid elevations; (5) areas of simple ulceration, most commonly at or near the trigone; (6) diminished capacity from contraction of the wall.

Symptoms.—*Acute Form:* (1) Severe pain in lower abdomen; (2) fever; (3) leukocytosis; (4) dysuria; (5) tenesmus; (6) frequency of urination; (7) pyuria; (8) urine, usually neutral or alkaline. The pain often radiates into the vagina or legs. Dysuria is most severe before urination and relieved by the act; in this it differs from urethritis, where it is most severe during the act.

Course of Acute Cystitis.—Acute cystitis usually subsides completely under treatment, and does not often persist in a chronic form.

Symptoms of Chronic Cystitis.—(1) Frequent urination; (2) pain just before urination; (3) moderate tenesmus; (4) cloudy urine; (5) ropy mucopurulent sediment; (6) bleeding *only* if due to stone, papilloma or cancer.

Course of Chronic Cystitis.—Chronic cystitis is often very intractable and resists treatment and often recurs after apparent cure.

Diagnosis.—Acute cystitis is made sufficiently clear by its symptoms alone and cystoscopy is contra-indicated; chronic cystitis can be diagnosed with certainty by cystoscopy. Through the cystoscope the vessels are seen enlarged and tortuous, the bladder mucosa reddened and dull, and in patches puffy and edematous. Ulcers are common, and stalactites of mucopus hang from the bladder wall. The diagnosis should not be made from cloudy urine alone unless pus is found microscopically, as the cloudy appearance of freshly passed urine is often only phosphates or urates.

Prophylaxis.—Many cases can be avoided by proper care during operations and above all by proper technic of catheterization, a safe technic of which is described in the beginning of this chapter; with the elimination of these two causes, cystitis is a rare affection.

Treatment.—1. *Acute Cases:* (1) Rest in bed; (2) milk diet; (3) hot water bag constantly over the bladder region; (4) large amounts of water by mouth (12–15 glasses a day); (5) urotropin 15 grains, acid sodium phosphate or benzoate of soda 10 grains four times a day. Urotropin, cystogen or helmitol are given in as large doses as the patient can take without bladder irritation. The benzoate of soda is given to acidulate the urine, so that the formaldehyd contained in the urinary antiseptics is freed. This will not occur if the urine is alkaline. (6) All forms of local treatment of the bladder are contraindicated in acute cystitis; irrigation is done only when

the acute symptoms have passed. For relief of pain it is best to use codein suppositories ½ grain and not hypodermics of morphin. If hypodermics are required the best are codein sulphate gr. ¼ or hyoscin gr. 1/100 or heroin gr. 1/12.

Chronic Cases.—(1) Any cause that can be found is removed; (2) descending infection from the kidney is excluded, by cystoscopy; (3) bland diet; (4) urinary antiseptics (helmitol, gr. 15 four times daily with benzoate of soda 10 grains if the urine is neutral or alkaline; (5) large amounts of water; (6) if there is much frequency of urination, a useful prescription is:

℞. Tinct. belladonnæ..... ℥i
Potass. citratis..... ℥ii
Liq. potass. citratis..... q. s. ad. ℥iii
M. Sig. Two teaspoonsful in water four times daily.

(7) bladder irrigation and instillation.

Technic of Bladder Irrigation.—Apparatus: a four-ounce glass or metal funnel, to which eighteen inches of rubber tubing is attached. This is in turn attached by a glass connection to a number 17 F. (6 American) soft rubber catheter. The whole is boiled before use.

1. The patient is arranged in the dorsal position, the vestibule carefully cleaned by cotton pledgets and lysol solution, the labia separated by the fingers of one hand and the catheter passed into the urethra.

2. The urine in the bladder is drained off.

3. The funnel is filled with solution, which runs into the bladder. Four ounces at a time are poured in, until the patient feels a strong desire to empty the bladder. The best solution is 10 grains to the ounce boric acid solution. Other good ones are nitrate of silver 1–6000; permanganate of potassium 1–5000. Any solution used should be at 110 F.

4. The funnel is lowered and the solution runs out.

5. The process is repeated three or four times, till the returning solution is perfectly clear.

6. After the bladder is clean, 2 ounces of 5 per cent. silvol

solution, or 25 per cent. argyrol or 1 per cent. hegonon are introduced with the same funnel and catheter and the patient is told to retain it as long as possible (several hours if she can).

7. Irrigations are repeated daily, but not oftener than once a day. Usually a course of treatment will last two to four weeks.

8. Irrigation is useless in tubercular cystitis.

9. The criteria for cure are: (1) The patient's subjective

FIG. 134.—Apparatus for irrigation of the bladder, consisting of a catheter, glass connection, rubber tube and a metal four-ounce funnel. A glass funnel is too liable to crack in boiling.

symptoms; (2) the condition of the urine; (3) the appearance of the bladder wall through a cystoscope.

Consequences of Chronic Cystitis. (1) *Ulcers.*—Unless these disappear under the irrigation treatment described above, they can be treated by local treatment through an air distention cystoscope, with the patient in the exaggerated Trendelen-

burg or knee-chest posture. Twenty grains to the ounce nitrate of silver is applied directly to the ulcer, on an applicator.

(2) *Contracted bladder* is not uncommon from the cicatrices of ulceration or from habit of frequent urination. It is very annoying to the patient, due to frequent urination.

Treatment.—(1) The patient and apparatus are prepared as for irrigation; (2) after the catheter is inserted in the bladder, sterile water is allowed to flow in, by gravity, until the patient complains of uncomfortable distention; (3) then 2 ounces more are inserted and the patient made to retain this for one-half hour if possible; (4) this procedure is repeated daily, gradually increasing the amount of water as it can be retained; (5) the treatment should be kept up until 32 ounces can be introduced and retained; this process taking from three to six weeks; (6) the patient is told to empty the bladder only three times daily as a maximum, to avoid reforming the habit of frequent urination.

In very severe cystitis, resisting other treatment, it may be necessary to secure constant drainage by *artificial vesicovaginal fistula.* The incision is made in the middle of the anterior vaginal wall, two-thirds of the way to the cervix. The incision is three-quarters of an inch long and the bladder and vaginal mucosa are sewed together, to prevent premature closure. The bladder is irrigated through the fistula twice daily with boric-acid solution. A permanent fistula is not to be feared. The fistula has a strong tendency to close spontaneously, and when the symptoms have subsided, the operation of closure is always successful, as there has not been the sloughing seen in traumatic fistula.

Cystitis Vetularum (old women) is a common affection, due to shrinking and gaping of the external orifice and direct invasion of bacteria through the urethra. There is great frequency of urination and often incontinence. The only relief is irrigation of the bladder with hot boric-acid solution, followed by ℥ss. of 25 per cent. argyrol or 5 per cent. silvol

solution repeated as infrequently as is compatible with reasonable comfort.

TUBERCULOSIS OF THE BLADDER

This is always secondary to some primary focus elsewhere, nearly always from the kidney. The affection in the bladder usually appears as ulcers of the trigone, especially around the ureter of the affected side. The corresponding kidney is searched for evidence of tuberculosis, as already described.

Treatment.—Nephrectomy, provided the disease is unilateral. The bladder ulcers will disappear spontaneously after nephrectomy, while no other treatment affects them.

If the disease is bilateral, or if there is active tuberculosis elsewhere, operation is contraindicated.

PAPILLOMA OF THE BLADDER

Papilloma is the most frequent tumor of the bladder. They are pedunculated, vary in size from a pea to the clinched fist. They are usually multiple, three or four being the commonest number, and may be widely disseminated over the interior surface of the bladder.

Structure.—A connective-tissue stalk, very vascular, covered with numerous layers of epithelium; hence their origin from the bladder epithelium. They are often partly or entirely encrusted with urinary salts, and for this reason, may be mistaken for stones in cystoscopic examination.

They should be regarded as malignant, and should be removed as completely as possible.

Symptoms.—(1) Hematuria; (2) all symptoms of chronic cystitis, frequency, tenesmus, etc.; (3) if the papilloma is in the trigone, sudden interruptions of the stream of urine.

Diagnosis is made by cystoscopic examination.

Treatment.—(1) Fulguration, through a cystoscope. Several applications of the current, three or four days apart are required. This is the best method, except in very large papillomata.

(2) Removal by a wire snare, through an operating cystoscope. This is much more difficult and not as satisfactory as fulguration.

(3) Vaginal cystotomy, in very large growths.

(4) Suprapubic cystotomy, in very large growths. This is better than vaginal cystotomy, because of the greater room for dealing with hemorrhage which may be very profuse and require packing of the bladder with gauze.

(5) In large growths, necessitating vaginal or suprapubic cystotomy, the most satisfactory technic is to open the bladder, remove the papilloma with a heavy wire or chain snare, and then fulgurate the base. In this way the bleeding is minimized.

Prognosis.—Papillomata often recur as carcinoma of the bladder wall, and patients should be regularly cystoscoped every two months over a period of three years, so that any area can be fulgurated in the early stage.

CANCER OF THE BLADDER

Cancer of the bladder is rare. It is of two kinds: (1) Primary; (2) secondary to cancer of the cervix. Primary cancer of the bladder occurs as (1) medullary; (2) scirrhous; (3) squamous epithelial; (4) papillary. It tends to perforate the bladder wall into the vagina, and gives metastasis to the deep pelvic lymphatics.

Symptoms.—(1) Hematuria, at first intermittent, later constant, with severe secondary anemia; (2) Severe cystitis.

Diagnosis is made by cystoscopic examination, when the ragged infiltrated area can be seen, if there is not so much bleeding that the fluid in the bladder is opaque.

Treatment.—(1) Papillary masses may be fulgurated or removed by the suprapubic route; (2) if far advanced, it is inoperable; (3) secondary invasion from the cervix is always inoperable; (4) total extirpation of the bladder, with ureteral implantation in the bowel or vagina, has a very high primary mortality, and secondary pyonephrosis is almost inevitable.

STONE IN THE BLADDER

Stone in the bladder is much less common in women, stone in men being two hundred times more frequent. This is due to the short, wide, dilatable urethra of the female, allowing small vesical or renal stones to escape before they have any chance to increase in size.

Stones are formed by crystallization of urinary salts and are composed of phosphates, oxalates, ammonium urates, carbonates, uric acid, cystin and xanthin.

Cystitis and ammoniacal urine are favorable etiologic factors. They always form about any foreign body, such as hairpins, nails, etc., which, introduced into the urethra for purposes of masturbation, have slipped into the bladder.

Probably the commonest nucleus for stone is a suture of permanent material penetrating the bladder in an operation for cystocele.

Site.—(1) Free in the bladder; (2) impacted in diverticula; (3) fixed in the urethra or ureteral orifice.

Symptoms.—(1) Hematuria; (2) cystitis, usually severe.

Diagnosis.—(1) May be felt by bimanual examination; (2) a sound in the bladder, will give the usual metallic click when it touches the stone; (3) *x*-ray; (4) cystoscopy, the most reliable of all.

Treatment.—(1) If small, the stone can be drawn out through a cystoscope; (2) if impacted in the ureteral orifice it can be dislodged and removed; (3) large stones can be crushed by a lithotrite and washed out by the evacuating apparatus; (4) stones too hard or large to be crushed, or those so impacted in a diverticulum that they cannot be dislodged, may be removed by vaginal cystotomy, or by suprapubic extraperitoneal cystotomy.

VESICO-URETHRAL FISSURE

Vesico-urethral fissure is a linear ulcer, beginning in the trigone and running through the vesical sphincter into the floor of the urethra, parallel with its long diameter. One-

third of the length is in the bladder, two-thirds in the urethra.

Cause.—(1) Gonorrheal urethritis; (2) cystitis; (3) passage of a stone with sharp edge; (4) injuries during cystoscopy.

Symptoms.—(1) Frequency of urination; (2) burning on urination; (3) pus or blood in urine; (4) intense pain just at the end of urination, the stream being followed by one or two drops of blood.

Diagnosis.—The linear ulcer can be seen plainly through a cystoscope or urethral endoscope.

Treatment.—(1) Injections of cocain solution, 4 per cent., into the urethra; (2) dilatation of the urethra up to a 42 sound; (3) repetition every other day for three or four treatments.

EXSTROPHY OF THE BLADDER

This is due to a defect of development of the anterior abdominal and bladder walls and symphysis, so that the interior of the bladder is exposed.

If the upper part of the bladder alone is exposed it is called superior vesical fissure. If the lower part of the bladder alone is exposed it is called inferior vesical fissure. If the urethra alone is involved it is called epispadias.

Treatment is directed toward control of incontinence, and is accomplished by plastic surgery, flaps being taken from the abdominal wall, planned to meet the needs of the individual case. Repeated operations are the rule, and complete success is rare.

OVERDISTENTION OF THE BLADDER

Overdistention of the bladder is common in women. It is due to (1) Pelvic tumors; (2) neurosis; (3) pregnancy with backward displacement of the uterus; (4) pressure in labor. The distended bladder causes a cystic tumor in the lower abdomen, easily mistaken for an ovarian cyst; there is often frequent urination or a constant dribbling.

Treatment is catheterization with a silk or wax catheter, and not a glass one, which latter is too short and too easily broken.

No diagnosis as to the nature of a cystic tumor should ever be made until the bladder has been emptied by catheter and *not voluntarily*.

IV. Diseases of the Urethra

1. **Congenital defects** as epispadias and hypospadias. The former is associated with exstrophy of the bladder. Hypospadias may be partial or complete. Incontinence always accompanies the complete, and in these cases there is a funnel-shaped opening, apparently communicating with the vagina, but really opening into the vestibule. The sphincter is absent.

Treatment is plastic operation, the success of which is doubtful. Complete success can only be attained when there is a partial defect and the sphincter is, in part at least, present.

2. **Stricture and Atresia.**—Both are less common in women. The stricture is usually at the upper third, near the bladder.

Causes.—(1) Injuries of childbirth; (2) caustics applied in treatment; (3) cicatricial bands; (4) disuse in fistulæ; (5) congenital.

Symptoms are (1) dysuria; (2) frequent urination.

Diagnosis is made by catheterization or sounding, when the obstruction is obvious.

Treatment is gradual dilatation by sounds, up to 42. Incision is rarely if ever necessary.

3. **Acute Urethritis.**—Acute urethritis is exclusively gonorrheal, and is of short duration.

Symptoms.—(1) First discomfort, then burning on urination; (2) meatus is swollen, hyperemic, everted; (3) orifices of Skene's glands are marked by erosion; (4) thick yellow purulent discharge.

Prognosis.—(1) Heals quickly and spontaneously or (2) passes into the chronic stage.

Treatment is given in Chapter XV, on gonorrhea.

4. **Chronic Urethritis.** *Causes.*—(1) Persistence after acute attack; (2) infection by other organism, notably colon bacillus or staphylococcus.

Site.—It is localized, usually in Skene's glands, and does not involve the whole canal.

Symptoms.—(1) Burning and pain during urination; (2) a thin scanty purulent discharge.

Diagnosis.—(1) Meatus is everted and edematous; (2) orifices of Skene's glands are eroded; (3) pressure on or milking of urethra will yield a drop or two of pus.

Treatment.—(1) Obliteration of Skene's glands, failing which a cure is unlikely; (2) applications of 30 grains to the ounce nitrate of silver solution to the canal, best by injection with a medicine dropper, every three days; (3) irrigation of the urethra, with boric acid solution, once daily through Skene's reflex catheter; (4) instillations into the urethra, every other day, of silvol ointment 5 per cent.; argentide paste 20 per cent. or 25 per cent. argyrol or 3 per cent. protargol in glycerin.

Treatment requires time and patience, as the disease is stubborn.

Consequences.—(1) Peri-urethral or suburethral abscess (see Chapter IV); (2) granular erosion of urethra, where the mucosa is papillary, bright red and very sensitive.

Treatment.—(1) As described in the treatment of chronic urethritis; (2) artificial vesicovaginal fistula, for drainage, hastens a cure.

5. **Urethral caruncle,** described in Chapter IV, number 16.

6. **Prolapse of the mucosa,** described in Chapter IV, number 17.

CHAPTER XV

GONORRHEA

Gonorrhea is an acute contagious disease, caused by the gonococcus; a biscuit-shaped diplococcus, Gram negative, staining by the ordinary methods, and found in the purulent discharge both free and intracellular.

1. **Mode of Infection.**—Except in the case of young children, where it is transferred indirectly, it is transmitted

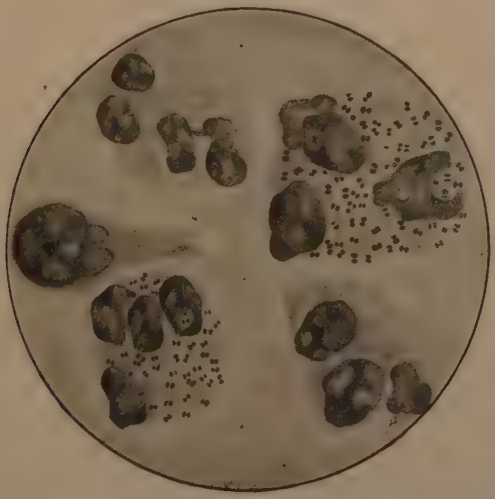

FIG. 135.—Diplococcus of Neisser, the gonorrhea germ, taken from the pus of the eye. The little dots are gonococci, the large masses are pus cells. (*De Lee.*)

almost exclusively by sexual intercourse. Rarely it may be spread by towels, napkins, douche nozzles or other foreign bodies, used by an infected person. A common type of case is

infection of the wife by a husband who has had gonorrhea, but who was supposed to be cured. The congestion and stimulus of intercourse will often light up an attack which under ordinary conditions gives no indication of its presence. It cannot be considered safe for a man to marry until at least one year after the disappearance of all symptoms.

2. **Variations under Culture.**—The gonococcus is purely a human organism. It is not found in other animals, and cannot be inoculated on other than human tissues. It will grow only in media made from human tissues; it will not grow on bouillon or other animal culture media. It can be cultured through numerous generations, gradually losing virulence, but when introduced into the human body, rapidly regains its lost virulence. It is infectious only in the moist state and grows only in the presence of moisture; if dried, it soon dies.

3. **Habitat.**—The gonococcus is particularly partial to columnar epithelium, where it dwells superficially and between the cells. It does not often involve the glands (of the cervix, uterus or Bartholin) but remains in their ducts. No abrasion of the surface is necessary for infection. Extragenitally, the commonest site of infection is the eye. It rarely penetrates the blood- and lymph-channels, but may do so, and localize in the joints and valves of the heart. It requires a moist surface, preferably columnar epithelium, with good blood-supply. The incubation period, from inoculation to the appearance of symptoms, is four days to a week.

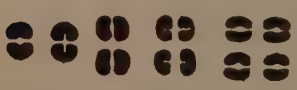

FIG. 136.—Indicating the shape of the diplococcus of gonorrhea (gonococcus). (*Norris.*)

4. **Growth.**—No break in the epithelium is needed. The gonococcus is at first piled on the surface, then penetrates to the deeper layers through the interstices between the cells of the surface epithelium, and when once under the surface, it is extremely difficult to eradicate.

5. **Latency.**—When confined in a closed sac, like a pyosalpinx, the gonococcus soon dies; when in gland ducts it remains

active for very long periods. It may remain latent for years, so that the patient, though infected, shows no symptoms, and suddenly light up into active virulence, because of local hyperemia from excessive intercourse, menstruation, childbirth, etc. The average period of latency is four or five years; longer periods are probably fresh inoculations, as the gonococcus does not confer immunity against successive attacks.

6. **Order of Infection.**—In the genitalia, the order of infection is approximately as follows: (1) The urethra; (2) cervix, at about the same time; (3) Skene's and Bartholin's glands; (4) endometrium; (5) tubes; (6) peritoneum.

7. **Lurking places** of gonorrhea, in chronic cases are: (1) Skene's glands; (2) Bartholin's glands; (3) ducts of the cervical glands; (4) patches in the endometrium; (5) rugæ in the folds of the tubal mucosa, provided there is no pyosalpinx.

The annoying and persistent leukorrhea in a case of chronic gonorrhea is almost exclusively from the cervix.

8. **Diagnosis.**—If a patient presents herself with complaint of burning on micturition, with profuse purulent vaginal discharge and examination shows the skin of the vulva red and chafed, covered with a yellow, creamy, leukorrheal discharge, the urethral orifice red and angry, exuding a few drops of pus when milked; the cervix eroded and the source of discharge, a presumptive diagnosis of gonorrhea is amply justified, and easily confirmed by the microscope. In cases past the acute stage, or of long standing, an accurate diagnosis may be extremely difficult, and depends finally upon microscopical examination of smears made from the discharge.

Preparation of a Smear.—(1) The patient is arranged in the dorsal position, and, except in acute cases, has been told to take no douche for the twenty-four hours preceding the examination; (2) pressure is made along the urethra, from behind forward, and if a drop of pus appears in the orifice, it is taken up on a small pledget of cotton on an applicator, and transferred to the surface of a clean glass slide.

A slide is better than a cover glass, unless permanent speci-

mens are desired, because it gives a wider field for examination and is more easily handled. A second slide is placed upon the first and the two are then slid apart, to ensure an even, thin distribution of the discharge.

3. The cervix is exposed through a bivalve speculum, any discharge visible is caught and prepared in the same way.

Staining is best done, except in doubtful cases, with 1 per cent. fresh aqueous methylene blue; (1) after the slide is dry, it is held in forceps and the surface flooded with the stain; (2) it is gently heated (so that it steams but does not boil) over a Bunsen flame or alcohol lamp for 8 minutes; (3) the stain is poured off, the slide washed and dried; (4) it is examined with a $\frac{1}{12}$-inch oil-immersion lens.

The nuclei of the pus cells are light blue, the gonococci very dark blue (almost black).

Doubtful cases are stained by the Gram method, in which case the gonococci, being Gram-negative, are not stained.

Technic (Tiedemann's Modification).—(1) The slides are prepared as usual.

2. The slide is flooded with 2 per cent. alcoholic solution of crystal violet, allowed to act for fifteen seconds.

3. The slide is slowly washed off by water dropping from a pipet (about ten seconds).

4. Flood slide with solution of iodin 1 gram, potassium iodid 2 grams, distilled water 100 mil and allow to act for fifteen seconds.

5. Wash thoroughly, dry and examine with $\frac{1}{12}$-inch oil-immersion lens. Any diplococci appearing in a specimen stained in methylene blue and not appearing when a second slide is stained as above, are almost certainly gonococci.

Doubtful Cases.—In old chronic cases, repeated examinations may fail to show positive evidence of gonococci. In such a case the diagnosis must rest upon the following:

1. Tell patient to drink a bottle of beer at night, and present herself for examination the next morning, *without douching*. The irritating effect of alcohol may cause slight temporary

activity in the discharge, sufficient to bring gonococci to the surface.

2. The complement-fixation test.

3. Search for the *stigmata* of gonorrhea: (1) Erosion of the orifices of Skene's glands; (2) erosion of the ducts of Bartholin's glands; (3) erosion of the cervix.

History of previous infection in the husband; a point requiring considerable diplomacy.

9. **Prognosis.**—If infection has travelled above the internal os, permanent cure is very rare; and in many cases infection of Skene's and Bartholin's glands and of the glands of the cervix resist treatment indefinitely. The acute stage of gonorrhea in women lasts for a short time only; the chronic stage lasts indefinitely.

10. **Kinds of Gonorrhea.**—(1) Acute—of short duration in women; (2) chronic—the type most commonly seen.

The treatment of both will be described according to the region they affect.

11. **Internal Treatment and General Hygienic Rules, Applicable to all Cases.**—(1) During the acute stage, rest off feet or in bed; (2) avoid all highly spiced foods, and alcohol in any form. Diet should be bland and easily digested; (3) avoidance of anything causing pelvic congestion, particularly sexual intercourse; (4) copious amounts of water daily; (5) cleanliness of genitalia; (6) if the patient has burning on urination, give bland diuretics, such as potassium citrate 2 drams; tincture of belladonna 2 drams; liq. potass. citratis q. s. ad. 3 ounces. Sig. Teaspoonful in water four times daily; (7) if nervous, give sodium bromid, 10 grains four times daily; (8) every patient, or person handling such a patient, should be warned of the danger of ophthalmia, and their hands should be kept scrupulously clean.

12. **Gonorrhea in Children** (Vulvovaginitis).—The modified squamous epithelium in children is soft, delicate, vascular and moist, hence very susceptible to gonorrheal infection, which in this type of case can be spread by indirect means.

Method of Infection.—(1) Depraved sexual practices; (2) contaminated linen, towels or diapers; (3) epidemics in institutions are often difficult to trace though a clue may be afforded by the fact that the gonococcus is infectious in the moist state only.

Symptoms.—(1) Swollen red labia; (2) severe chafing of perineum and inner side of thighs; (3) considerable pain and tenderness; (4) profuse purulent yellow discharge, in which gonococci are found microscopically.

The disease is most often confined to the vulva, labia and external genitalia; it only rarely involves the uterus and tubes, though it may involve the vagina, causing ulceration and subsequent adhesion of the opposing surfaces. In a small percentage of cases the urethra is infected.

Treatment is difficult and requires prolonged effort and patience.

Prophylaxis is possible only in institutions and any suspected case should be rigidly isolated, until the vaginal discharge can be proven innocent. Nurses caring for suspected or actual cases should also be isolated, and all dressings burned. Special utensils must be kept for these patients.

Treatment of Acute Stage.—During the acute stage there is so much tenderness that treatment can be directed only toward keeping the external genitalia as clean as possible, by external irrigation and sponging with boric acid solution or 1–5000 potassium permanganate. There is marked tendency to desquamation and adhesion of the labia; hence the inner margins of the labia should be kept covered with boric acid ointment, until the acute stage is past.

Treatment of chronic stage is usually prolonged, and while the uncomfortable symptoms can be controlled quickly, a cure is a matter of months, and relapses are frequent.

1. If the hymen is of such a character that it interferes with the necessary treatment, it must be sacrificed.

2. The vagina is dried out with a thin strip of gauze, and through a narrow speculum or endoscope, is painted with 5 per cent. nitrate of silver solution.

3. A vaginal douche of 1–3000 permanganate solution is given twice daily, through a catheter.

4. The external genitals are kept scrupulously clean.

5. Every other day, the vagina and labia are flooded with 25 per cent. argyrol solution, or 25 per cent. ichthyol in glycerin or 10 per cent. silvol solution, injected with a medicine dropper.

6. The child is kept from active exercise, is given a bland diet with plenty of water; its underclothes are kept separate and boiled before washing, and all contaminated dressings are burned.

7. Vaccines are useful in shortening the duration of infection.

Prognosis of Chronic Stage.—The disease may last for years, in recurrent periods; three to six months are necessary for the disappearance of gonococci; very young children respond more quickly to treatment. Requisite for cure are four consecutive negative smears at weekly intervals.

Complications of chronic stage are common, especially in neglected cases; (1) inguinal adenitis (rarely suppurative); (2) venereal warts; (3) arthritis (subacute form); (4) ophthalmia, from hand infection; (5) peritonitis; (6) cystitis and pyelitis (rare).

Recurrences are common, even after an interval of several years, and are treated like the original attack.

13. **Gonorrheal urethritis** is the commonest manifestation of primary infection in the adult, the epithelium of the meatus being a favorable medium for growth of the gonococcus. The disease is most commonly limited to the lower one-third of the urethra, and to Skene's glands.

Symptoms.—(1) The vestibule is red and tender; (2) the meatus is pouting, edematous and exudes a thick yellow pus; (3) the orifices of Skene's glands are visible and eroded; (4) marked burning, with occasionally severe pain, during urination; (5) many cases produce negligible symptoms, so that the acute stage passes unnoticed.

Prognosis.—(1) The duration is from three to six weeks, though the acute symptoms last only a few days.

2. There is slight danger of cystitis, unless the infection is carried in by injudicious use of a catheter.

3. Chronic urethritis may persist for years in Skene's glands, until the ducts are destroyed by cauterization.

Treatment.—In addition to the general treatment described under section eleven in this chapter; (1) irrigation of the urethra with boric acid solution or 1–5000 potassium permanganate solution, using Skene's reflux catheter, and being careful not to push the catheter past the internal sphincter; (2) injection in the urethra of 5 per cent. argyrol or protargol or silvol in glycerin, injecting only 1 mil to avoid entering the bladder. The patient should not urinate for at least an hour following the injection; (3) obliteration of Skene's glands, in chronic cases.

Complications.—(1) Abscess of Skene's glands (see Chapter IV); (2) stricture, much less common in women.

14. **Vulvovaginitis** in the adult is rare, due to the tougher character of the epithelium. At the vulva, inflammation is usually secondary to inflammation of Skene's or Bartholin's glands; in the vaginal vaults, it is secondary to the cervix. Whatever form of treatment is instituted, it is essential that every care should be taken not to extend infection higher up in the genital canal, and that no instruments or solution should be used which would irritate or injure the epithelial surface.

Treatment.—(1) Through a bivalve speculum, the cervix and vaginal vaults are sponged off with cotton pledgets soaked in salt solution (1 dram to the pint; to dissolve mucus) and then by plain water to remove the salt.

(2) The cervix and vaginal vaults are painted over with argyrol solution 25 per cent. or protargol 2 per cent. or silvol 10 per cent. or nitrate of silver 8 per cent. and the excess sponged out.

(3) A large tampon, with 50 per cent. ichthyol in glycerin, or 25 per cent. boroglycerid, is packed rather firmly in the vaginal vault; two other dry tampons are packed in below it and the bivalve speculum removed.

(4) If there is much discharge, the tampons are removed in twelve hours, otherwise in twenty-four.

(5) The patient takes a douche of 1–3000 permanganate solution twice daily until the tampons are replaced.

(6) The tampons are renewed every three days.

Dry treatment consists of drying the cervix and vaginal vaults with gauze, through a bivalve speculum, and insufflating a powder (a satisfactory one is carbolic acid 2 drams, burnt alum 1 ounce, boric acid 3 ounces) with a Politzer bag. After the powder is blown in, a wool tampon heavily dusted with the same powder is inserted and left in place twenty-four to forty-eight hours, when it is removed and the treatment is repeated. It is satisfactory only when discharge is scanty.

15. **Cervical gonorrhea** (*endocervicitis*) is either primary or secondary. The cervix is involved in most cases of gonorrhea in the adult. As the cervix is quite insensitive, pain in the acute stage is absent.

Symptoms.—1. *Acute Stage:* (1) The cervix is red and angry looking; (2) the external os is eroded; (3) the erosion bleeds easily to the touch; (4) there is a profuse yellow purulent discharge; (5) gonococci are found on microscopic examination.

Treatment.—It is not advisable to make any application to the cervical canal during the acute stage, because of the danger of carrying infection to the uterine cavity. The treatment as outlined in the previous section (14) of this chapter gives good results.

2. *Chronic stage* is one of the most stubborn conditions in gynecology. The gonococci have penetrated the ducts of the cervical glands, a mixed infection has taken place, and the irritation of this infection causes a profuse stringy mucopurulent discharge.

Symptoms.—(1) The patient's chief complaint is a profuse, annoying leukorrhea; (2) the cervix is eroded; (3) the cervix and vaginal vaults are covered with stringy cloudy mucopus; (4) gonococci may be found with some difficulty.

Treatment.—In addition to the treatment described in section 14, the following will be found useful:

(1) Instillation into the cervix, with an instillating syringe, of 25 per cent. argyrol, 10 per cent. silvol; 50 per cent. ichthyol all made up in glycerin (watery solutions run out at once, while the thicker glycerin exudes slowly from the cervical canal), injections are given every other day. (2) Electrolysis with a copper electrode. The electrode is placed in the cervix, the positive pole attached to it, and a galvanic current of 25 to 40 milliamperes allowed to flow for thirty minutes every other day. (3) Amputation of the cervix, if there is hypertrophy and severe erosion.

Douches are used for cleanliness only, as they do not reach the seat of the infection.

Prognosis.—The condition is exceedingly stubborn. Treatment must be continued until the cervical mucus is clear, and then interrupted to watch results. Relapses are common.

16. **Gonorrheal Endometritis.**—The endometrium is fairly immune to a permanent gonorrheal infection. Invasion from the cervix takes place usually just before or just after a menstrual period. The endometrium seems to serve chiefly as a bridge for the gonococci to reach the tubes, and not as a permanent home. The chief source of discharge is the cervix and *not* the corporeal endometrium. For these reasons gonorrheal endometritis is not a disease for local or general treatment except as an incident in the treatment of complicating pyosalpinx.

Curetment can do only harm and is absolutely contraindicated except in connection with laparotomies for removal of the tubes for salpingitis, when there is usually a chronic endometritis existing with the tubal disease. Curetment of a case where the tubes are not diseased, is a sure way of producing an acute pyosalpinx or pelvic abscess.

Many cases of pelvic inflammation are associated with menorrhagia or metrorrhagia, but this is not an indication for curetment, unless at the same time the tubes are removed.

In operation for gonorrheal pyosalpinx, a preliminary curetment should always be done, followed by cauterization of the endometrium with tincture of iodin (7 per cent.) and pure carbolic acid equal parts, and the vagina then wiped out with 95 per cent. alcohol (but not the uterus).

17. **Gonorrheal salpingitis and pelvic abscess** have been described in Chapter VIII.

18. **Complications of gonorrhea** are (1) Abscess of Skene's glands (Chapter IV); (2) abscess of Bartholin's glands (Chapter IV); (3) condylomata acuminata (venereal warts) (Chapter IV); (4) arthritis; (5) general septicemia; (6) peritonitis; (7) pyelitis; (8) ophthalmia.

Arthritis is rare in women, but may appear in any case. It is much more common after labor or miscarriage than at other times. The joints most commonly affected are the ankle, elbow, wrist, knee, in that order, and then the small joints.

Suppuration is not the rule, but the risk of ankylosis is about 20 per cent.

Treatment.—(1) Immobilization of the part; (2) application of saturated magnesium sulphate solution or equal parts of dilute leadwater and alcohol; (3) strapping after the acute stage is past; (4) massive doses of vaccines.

Peritonitis is usually the result of general gonorrheal septicemia, and, if a diagnosis of its nature can be made, is best treated conservatively, as the prognosis is favorable.

Ophthalmia is a serious risk to any patient or attendant, from hand infection. All persons should be warned of the danger and cleanliness enforced.

19. **Vaccines and Serum.**—Gonorrhea is as a rule not much influenced by vaccine or serum, with two important exceptions: (1) Vulvo-vaginitis in children; (2) gonorrheal arthritis. The serum is prepared from the blood of sheep who have been treated with virulent culture of gonococci.

Dosage is 2 c.c. given daily in the thigh, for five successive days. There is considerable local reaction, due to the toxicity of the serum, and results have not been encouraging.

Vaccines need not be autogenous. The commercial preparations of mixed strains are satisfactory. The opsonic index should be taken, but even this is not essential.

Dosage at first ten to twenty millions, given five days between doses, and increasing by ten or twenty millions to each dose. An average number of six injections will be required. Local and general reactions are often seen, but usually mild and of short duration. Anaphylaxis is not to be feared, except after small doses with long intervals. Large doses are safer than small ones, and there is more danger of anaphylaxis in chronic than in acute cases.

CHAPTER XVI

NORMAL MENSTRUATION AND ITS ABNORMALITIES

Menstruation appears usually about the fourteenth year, and continues until the forty-fifth. It may appear as early as the eleventh year or as late as the sixteenth, and still be within normal limits. When first established, periods are apt to be irregular, but when fully instituted, the average interval is twenty-eight days. The interval next in frequency is twenty-three days.

Duration of the flow is three or four days.

Amount of flow is, on the average, 50 grams (3 ounces). It is less in single women, and somewhat more in women who have had children. It is usually measured by the number of napkins used; a flow requiring, during its height, more than three napkins a day, can be regarded as excessive.

Character of Menstrual Blood.—It is more watery and darker than normal blood. It is mixed with epithelium and mucus from the cervical and uterine glands. It does not clot, due to the alkaline cervical mucus with which it is mixed, or possibly to a local influence of ovarian secretion.

Factors Influencing Menstruation.—(1) *Climate*, though to a less extent than formerly supposed. It affects the frequency of the periods rather than the age of puberty; the intermenstrual interval being longer in colder regions; (2) *changes of climate*, causing amenorrhea or menorrhagia (in the tropics); (3) *social conditions;* the poorer classes beginning late and ending earlier than the well-to-do; (4) city dwellers come to puberty slightly earlier than those who live in the country; (5) nulliparous women and virgins reach the menopause earlier

FIG. 137.—PREMENSTRUAL ENDOMETRIUM. (*Graves.*)

Low power. At the bottom is the muscle of the uterine wall, sharply demarcated from the endometrium. The glands in the deepest part of the endometrium are small, their epithelial cells low, for this part of the glands remains inactive. The stroma cells are small and lie close together. At the middle of the endometrium the glands are dilated, the epithelium wavy, and the epithelial cells swollen and actively secreting mucus. The stroma cells are larger and lie further apart. On the right the dilatation of the blood-vessels is well shown. Near the top the glands have the same characteristic as at the middle, but there is more edema of the stroma. Throughout there is a slight infiltration with round cells.

than those who have had children; (6) those who reach puberty early tend to menstruate profusely and reach the menopause late.

The uterus during menstruation is larger, softer, more compressible, and shows marked congestion, as do all the pelvic organs, both internal and external genitalia.

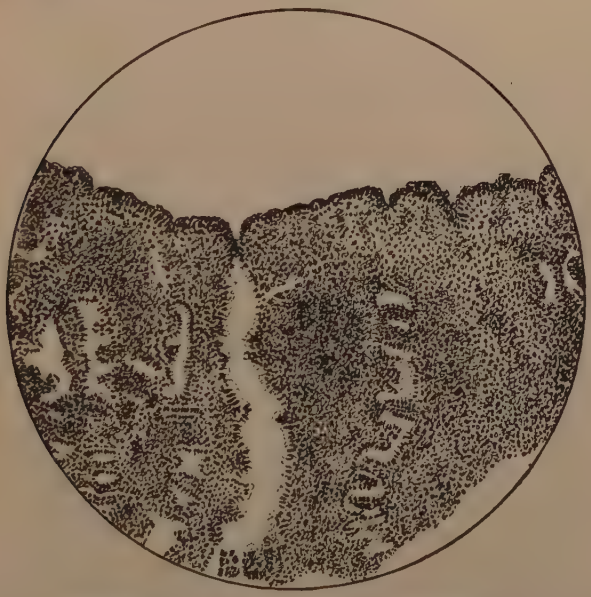

FIG. 138.—ENDOMETRIUM AT BEGINNING OF MENSTRUATION. (*Graves.*)

The glands, except for the one seen in the center, have collapsed, having discharged the material which was secreted during the premenstrual stage. The blood-vessels have been eroded by the ferment contained in the secretion, allowing the blood to exude into the tissue and on the surface of the endometrium. The surface epithelium in this section is still intact.

Precocious menstruation, seen in very young subjects, two to four years old, usually associated with abnormally developed breasts and genitalia, and is due to abnormalities in the glands of internal secretion, especially the pineal.

The Endometrium during Menstruation.—The uterine

mucosa passes each month through three phases or cycles: (1) Premenstrual congestion; (2) period of menstruation; (3) postmenstrual involution.

1. *Premenstrual congestion* begins about ten days before the period. The mucosa is thickened (6–7 mm. in depth). The

FIG. 139.—POSTMENSTRUAL ENDOMETRIUM. (*Graves.*)

Low power. The surface epithelium is regenerated. The glands are still dilated, but the epithelium is low, the nuclei of the cells small and lying at the bases. There is some edema of the stroma near the top, but the cells are smaller, the blood-vessels collapsed. There is a slight infiltration with round cells and blood-corpuscles.

cells are swollen and pale—like decidua cells. The endometrium presents two layers—the deep *spongy* layer containing the glands and the superficial *compact* layer, formed of swollen stroma cells. The surface is irregular and furrowed, and the blood-vessels dilated and tortuous.

2. *Stage of Menstruation.*—The blood escapes partly by actual rupture of the vessels, but largely by diapedesis, and forms subepithelial hematomata. Uterine contractions force the blood through the mucosa into the uterine cavity, partly through the interstices of the cells of the gland lumina and partly by actual desquamation of the surface epithelium.

3. *Postmenstrual involution* or stage of quiescence. After the cessation of bleeding, the mucosa shrinks to its previous thickness of 2–3 mm. The blood-vessels contract, the ex-

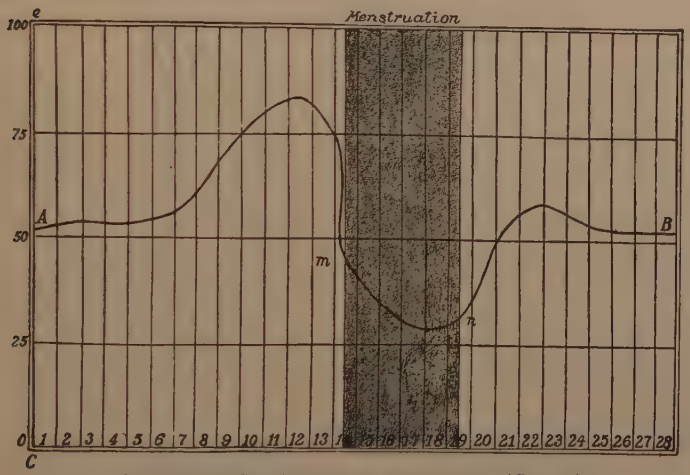

FIG. 140.—Goodman-von Ott wave. (*Graves.*)

travasated blood is absorbed. The broken epithelial layers replaced by new cells. The glands resume their narrow and straight form. This stage lasts about fourteen days, and the cycle then begins anew. During the cycle of congestion there is a glycogen production from the mucosa, reaching its height during menstruation and disappearing during the stage of quiescence.

The Goodman-von Ott curve or wave is a diagrammatic curve representing the energy of all functions of the female organism, with reference to the menstrual period. This energy

is at its height three days before the flow, and at its lowest at the end of the period.

The molimina of menstruation are the visible evidences of the process, affecting not only the genitalia but the entire organism. The breasts are often engorged and frequently secrete colostrum; there is usually a marked physical and mental depression; the nervous system is particularly unstable; mostly manifested by irritability, neuroses and headache; pelvic discomfort is the rule, varying from a sense of pressure to severe cramp-like pains; vasomotor disturbances are common—nose-bleed, edema of the throat and larynx, hot flushes, etc.; skin eruptions often appear only at this time. The sexual impulse is increased just before or after the period, and decreased or absent during the flow.

Pain midway between periods is most commonly due to intramural fibroids, but often occurs without demonstrable cause.

Relation of Menstruation to Ovulation.—The two processes can and often do occur independently. In a strictly normal case, ovulation should precede menstruation by two or three days, but the occurrence of pregnancy during the amenorrhea of lactation is sufficient proof that there is no absolutely fixed relationship.

ABNORMALITIES OF MENSTRUATION

I. Amenorrhea (Absence of Flow)

Causes.—I. *Anatomical.*—(1) Ill development; (2) atresia of hymen, vagina or cervix; (3) congenital absence of uterus.

II. *Constitutional.*—(1) Chronic systemic disease like tuberculosis, diabetes, nephritis; (2) change of climate; (3) neurotic, as in cases of pseudocyesis; (4) disturbances of glands of internal secretion.

III. *Physiological.*—(1) Before puberty; (2) pregnancy; (3) lactation; (4) menopause.

IV. *Pathological.*—(1) Inflammation destroying the ovary; (2) operations removing ovaries or uterus; (3) acquired atresia; (4) pelvic tumors (most commonly ovarian cysts).

Under "functional amenorrhea" are classed cases not due to any definite pathological cause, such as fear or anger, climatic changes, obesity, exposure to cold, etc.

Amenorrhea of Youth.—It is common for menstruation to be very irregular or scanty for one or two years from its first appearance. Periods of three to six months pass without a flow. If the patient retains good health, no treatment is required. In nervous, anemic, ill-developed girls, great benefit can be derived from hypodermic administration of corpus luteum or whole ovarian extract. Dosage is one ampule (representing 20 mg. of the dried substance), given intramuscularly daily in series of 24 doses. This is much better and more reliable than mouth administration of tablets or capsules of ovarian substance (5 grains four times daily).

Treatment of amenorrhea depends largely on the cause, if one can be found.

Absence of flow due to atresia is not true amenorrhea, as the flow occurs, but is dammed back. The treatment of these cases is described in Chapter III. Ill development can be helped by (1) hypodermic injections of 1 mil. (representing 20 mg. of dried gland) of corpus luteum or whole ovarian extract, daily in series of twenty-four doses, with an interval of several weeks between series; (2) electrical stimulation of the uterus, the negative pole in the uterus, using galvanic, slow faradic and sinusoidal currents, three times weekly for forty-five minutes at each treatment. 3. In congenital absence of the uterus, nothing can be done. 4. Amenorrhea due to chronic systemic diseases will yield as a rule to treatment of the disease at fault. Anemia requires prolonged administration of iron, arsenic and strychnin, a very satisfactory capsule being the following:

℞ Acid. arsenios.....gr. ⅓
Strychnin sulph.....gr. 1
Ferri pyrophosphat.....gr. 150
M. Ft. caps. No. 30
Sig. One three times daily.

5. None of the physiological causes require any treatment but it is worth remembering that prolonged nursing may give rise to such a degree of lactation atrophy as to cause permanent amenorrhea. These patients are treated like those with ill development. 6. The pathological causes destroying the ovary or uterus are irremediable. The only chance is implantation of sections of ovary, with very small chance of success. Corpus luteum extract will banish the disagreeable symptoms of the menopause, but will not cause the flow to return. The commonest pelvic tumor to cause amenorrhea is the large ovarian cyst. After removal of the cyst, unless bilateral, regular menstruation will return. 7. Functional amenorrhea due to severe anger, fright, nervous shock, fear of pregnancy requires no treatment. That due to change of occupation or climate (as in domestic servants) requires good food, hygiene, regular rest and exercise, and prolonged courses of iron, arsenic and strychnin. That due to cold is described under the heading "Acute Suppression."

Emmenagogues.—Drugs to produce menstruation are of little value. Those most used are: (1) oxalic acid gr. ¼ four times daily, given in 2 drams syrup of lemon; (2) dioxid of manganese gr. 2 four times daily; (3) permanganate of potassium gr. 2 four times daily; (4) aspirin gr. 5 four times a day. They all tend to upset the stomach and are not recommended.

The best emmenagogue is the electrical current, *galvanic*, negative pole to the uterine electrode.

Chlorosis is a disease occurring at puberty, having a tendency to recur at the menopause, characterized by a nearly normal red count and a low hemoglobin content. The coagulability of the blood is increased.

Symptoms.—(1) The patient is pale, with a peculiar greenish tint, and usually underdeveloped; (2) she complains of amenorrhea, or very scanty flow associated with dysmenorrhea; (3) the blood count is as described above; (4) there is no leukocytosis; (5) marked dyspepsia due to hyperacidity.

Treatment.—(1) Fresh air, open air exercise and nourishing

food; (2) alkalis (sod. bicarbonate) for the hyperacidity; (3) iron, in the form of Blaud's pills (three to nine a day) is the most valuable single drug; (4) mild saline laxatives; (5) very severe cases require complete rest in bed; those with a hemoglobin percentage of below thirty.

Prognosis is good, though up to the twenty-fifth year relapses are common.

Acute suppression of menses is most often due to cold. It is associated with severe, often agonizing, pelvic pain, simulating peritonitis, due to severe pelvic congestion.

Treatment.—(1) Be sure the suppression is not due to normal or extra-uterine pregnancy; (2) rest in bed; (3) hot flaxseed poultice or hot water bag to lower abdomen constantly; (4) hot vaginal douches (1 gallon at 120°F., run in slowly with patient lying down) of sterile water four times daily. In young girls, hot enemata are substituted; (5) saline purge (best *flat* magnesium citrate, 12 ounces); (6) for the relief of pain give antipyrin gr. 2, ammonium carbonate gr. 3 every three hours; salol and phenacetin each gr. 2½ every three hours; tincture of aconite one drop every half hour until the sense of pelvic congestion is relieved; codein sulphate gr. ¼ hypodermically; heroin gr. 1/12 or morphin gr. 1/6 hypodermically only as a last resort.

Scanty menstruation is due to many of the same causes that lead to amenorrhea and the treatment is the same.

II. Dysmenorrhea or Painful Menstruation

Causes.—(1) Mechanical obstruction due to congenital or acquired stenosis of the internal os; (2) malposition of the uterus (anteflexion, retroflexion and retroversion, in that order of frequency); (3) ill development of the uterus, usually associated with stenosis; (4) pelvic congestion, due most often to uterine displacement; (5) pelvic inflammation, of tubes and ovaries; (6) postoperative, due to ligatures or adhesions; (7) cirrhosis of the ovaries.

Dysmenorrhea is not a disease, but a symptom of many pelvic diseases.

Symptoms.—(1) Pain, cramp-like and often severe, either just before or during the first day of the period; (2) incapacity of varying degree; (3) the pain extends down the back of the legs, and is often associated with a sense of prolapse; (4) symptoms usually appear early in menstrual life and tend to grow worse; (5) headache, general malaise and vomiting are common; (6) the intermenstrual interval is usually free from pain.

Intermenstrual pain ("mittelschmerz") is due usually to an intramural fibroid, though it not infrequently occurs in patients in whom no cause can be found.

Treatment of dysmenorrhea depends upon the cause.

Medical treatment is unsatisfactory. A great number of drugs have been recommended, but all fail frequently. The best are: Antipyrin gr. 2, ammonium carbonate gr. 3 every four hours; (2) aspirin gr. 5 four times a day; (3) sodium bromid, gr. 20 four times daily; (4) alcohol (whiskey, or brandy oz. ½ in 4 ounces very hot water); (5) atropin, grain $\frac{1}{100}$ by mouth three times daily, for two days before and the first two days of the period; (6) soluble ovarian extract or corpus luteum extract 1 mil (20 mg.) hypodermically twice daily. (7) morphin, heroin and other habit-forming drugs are to be avoided. Their use in women with dysmenorrhea is one of the commonest causes of drug habit.

Nasal Treatment.—In patients who have any nasal abnormality (deflected septa, hypertrophy of the middle turbinates, etc.) and those in whom the flow is preceded by headache and nausea, cocainization of the "genital spots" in the nose (the tuberculum septi and middle turbinate) has given good results. At present the galvanocautery or trichloracetic acid is used with more lasting effect, and if good results are obtained at the first trial, the procedure is repeated between the periods. After two or three treatments, the relief is said in many cases to be permanent.

Operative Treatment.—(1) In cases of stenosis, forcible dilatation, followed by either Schatz's metranoikter or the Wylie drain (preferably the former), will give most satisfactory results. The technic is described in Chapter VII. Dilatation alone, without some means of keeping the canal open for some time, is practically useless.

2. Dudley's operation of splitting the cervix and inserting stitches so as to eliminate the cervical canal, is mutilating and is often followed by a troublesome endocervicitis, which may require repair or amputation of the cervix.

3. In cases complicated by backward displacement of the uterus, the displacement must be corrected by pessary or operation.

4. Cases due to pelvic inflammation and adhesions require abdominal section.

5. Cases due to ovarian cirrhosis (seen in elderly nulliparæ, the pain being due to ovarian congestion causing the ovary to swell against its firm shrunken capsule) require abdominal section. This is the type called ovarian neuralgia and is sometimes seen in young women.

Marriage and Sterility.—Many cases of essential dysmenorrhea are sterile, due to anteflexion and stenosis or ill development. These cases are helped by marriage, and if they should become pregnant, the dysmenorrhea is permanently cured by the dilatation during delivery.

Membranous dysmenorrhea is a condition characterized by intense pain at the menstrual periods, accompanied by exfoliation and discharge of portions of the uterine mucosa varying from small pieces to complete casts of the uterine cavity. As this mucosa is the menstrual compact layer, its likeness to decidua is such that even in microscopic section there may be doubt as to the diagnosis.

Cause is not definitely known. It is ascribed rather vaguely to an abnormal reaction between the ovarian secretion and the uterine mucosa. Some cases follow abortion and in these there can be demonstrated chronic interstitial endometritis.

Symptoms are as given in the definition of the disease.

Prognosis as to complete cure is not good, and treatment is often unsatisfactory.

Treatment.—The best treatment is dilatation and curettage just before the period, during the stage of thickening of the mucosa, followed by cauterization of the endometrium by iodin (7 per cent. tincture) or carbolic acid or steam (atmokausis, see section on metrorrhagia). Repeated operations are required, as a rule.

Nervous symptoms vary from nervous dread of the pain of the approaching period up to epileptiform convulsions (hystero-epilepsy). They are treated by removing their primary cause (the pain), good hygiene and diet, regular exercise and occasionally mental therapy and suggestion. In hystero-epilepsy, oöphorectomy is *not* indicated, as it does no good.

III. Menorrhagia (Excessive Menstrual Flow)

By this term is meant (1) an increased flow at the periods; (2) increased frequency of the periods (the interval being free from any bleeding); (3) prolongation of the menstrual period.

Amount of Flow.—If the period requires more than three or four napkins daily (a total of twelve to sixteen), or requires that the napkins be worn double, or if there are clots of considerable size, the flow is abnormal.

Causes.—(1) Displacements of the uterus; (2) pelvic congestion from any cause especially with subinvolution of the uterus; (3) fibroid tumors; (4) chronic endometritis; (5) chronic pelvic inflammation; (6) excessive or abnormal coitus; (7) valvular heart disease; (8) high blood-pressure; (9) polyps (mucous or fibroid); (10) menorrhagia of youth; (11) approaching menopause (always suspicious); (12) "functional"—in which no definite cause can be found.

Treatment.—Menorrhagia is a symptom only, and if the causative conditions be found and removed, the menstrual flow returns to normal. In cases of valvular heart disease or

abnormally high blood-pressure, the bleeding may be beneficial, and when checked, the patient is uncomfortable.

For checking the bleeding at the time of the period, the following are indicated: (1) Rest in bed; (2) laxatives sufficient to secure one or two good movements a day; (3) sedatives (strontium bromid gr. 15 every three hours) if the patient is nervous and restless; (4) styptics; ergot gr. 1, strychnin sulphat. gr. $\frac{1}{30}$ in capsule four times daily; or fluid extract of ergot 20 drops four times daily; or stypticin gr. 1, four times daily; or cotarnin hydrochlorid gr. 1 four times daily; or styptol gr. $\frac{3}{4}$ five times a day; or hydrastinin gr. $\frac{1}{2}$ four times daily. All these alkaloids are efficient but very expensive; (4) if dysmenorrhea is also present (a common complication), and is severe, $\frac{1}{2}$ grain opium suppository is given twice daily, but the patient is not told the nature of the drug; (5) calcium lactate or chlorid gr. 20 four times daily, to increase the coagulatibility of the blood; (6) in severe bleeding, vaginal tampons of sterile gauze for twenty-four hours may be needed.

Animal extracts (pituitrin; mammary extract; suprarenal extract) have given poor results in menstrual excess in the adult. The most reliable is pituitrin $\frac{1}{2}$ mil hypodermically twice daily. *A point never to be forgotten is that a sudden excessive menstrual flow may be a very early abortion; the patient often not knowing she is pregnant.*

Menorrhagia of Youth.—In young girls, excessive menstrual flow is not uncommon. The loss of blood may be very severe and alarming, and has been fatal. The severe cases are probably hemophilic in origin. Some of the less severe cases are due to hypertrophic glandular endometritis, but in many no cause at all can be found. The cause is supposed to lie in loss of balance of the internal secretory glands, particularly the thyroid, but this has not yet been proven.

Treatment should be as conservative as possible.

(1) Pituitrin $\frac{1}{2}$ mil hypodermically daily for eight or ten doses, though three or four are usually enough. This is the most valuable single drug; (2) calcium lactate gr. 20 four times

a day, between the periods; (3) thyroid extract 5 grains four times daily, between the periods. This routine treatment is ordinarily all that is required.

Severe cases: (1) Normal horse serum, 50 c.c. subcutaneously and repeated daily for three or four doses; (2) transfusion, preferably from one of the parents, 250–500 c.c. of blood; (3) dilatation and curettage of value only in the cases of glandular endometritis; (4) atmokausis (see treatment of metrorrhagia); to be avoided if possible; (5) *x*-ray will stop nearly all cases, but is to be avoided except as a last resort, because of the damage done to the ripening ovarian follicles, and the danger of permanent menopause; (6) radium treatment is difficult of application, except under anesthesia. It is efficient but open to the same objections as the *x*-ray; (7) only as a last resort, and very rarely if ever necessary, hysterectomy.

IV. Metrorrhagia (Irregular Bleeding, Irrespective of Menses)

All metrorrhagia is pathologic, and should be regarded as serious, especially as the patient nears the age of the menopause. The hemorrhages of pregnancy are included under this head, but their discussion belongs properly in works on obstetrics.

Causes.—(1) Incomplete abortion; (2) extra-uterine pregnancy; (3) laceration and erosion of cervix; (4) retroversion of uterus; (5) chronic endometritis; (6) fibroid or mucous polyps; (7) fibroid tumors; (8) ovarian cysts (though amenorrhea is commoner); (9) cancer of the uterus; (10) pyosalpinx; (11) valvular heart disease; (12) high blood-pressure; (13) any cause of acute or chronic pelvic congestion; (14) myopathic uterus (fibroid degeneration of the muscular wall); (15) infectious diseases, notably *malaria*.

Diagnosis of the Source.—(1) Inspection of the cervix through a bivalve speculum. In this way erosion, laceration, polyps, or cancer can be seen; (2) bimanual examination, to detect gross pathological lesions; (3) dilatation and curettage,

followed always by exploration of the uterine cavity with placental forceps, to extract if possible polyps that the curet might slip over. All the scrapings should always be examined microscopically; (4) uterine endoscopy, when with an instrument like a urethroscope, the uterine cavity can, after proper dilatation with Hegar's bougies, be inspected; (5) excision of a piece of the cervix, for microscopic examination for cancer; (6) anterior vaginal hysterotomy, when a submucous fibroid is suspected with reasonable certainty; (7) in all cases, the heart should be examined and blood-pressure taken.

Treatment.—Metrorrhagia, like menorrhagia, is a symptom, and the cause should be sought and removed. In sudden, severe bleeding, the possibility of pregnancy and miscarriage must never be forgotten.

(1) Bleeding from incomplete abortion is quickly and easily controlled by cleaning out the uterine cavity with placental forceps, usually without anesthesia; (2) small polyps in the cervical canal or protruding can be removed without anesthesia; (3) bleeding due to valvular heart disease can be checked or at least diminished by oil of erigeron, ℳx four times daily by mouth; (4) in high blood-pressure, the bleeding may be beneficial; (5) vaginal douching, tampons, or intra-uterine application are of little use; (6) cancer, diagnosed by inspection of the cervix or by exploratory curettage, requires prompt panhysterectomy.

In Cases without Marked Local Lesion.—(1) Styptics, as described under menorrhagia; (2) electricity, positive pole to uterine electrode, with galvanic current of 40 milliamperes for forty-five minutes three times weekly; (3) animal extracts (pituitrin, thyroid, suprarenal extract) though these are not efficient as a rule, except in very young patients; (4) *x*-ray, except in degenerated fibroid, where it is contraindicated; (5) radium, with the same limitations as the *x*-ray, with the additional one of the great expense of the supply required. Radium is indicated particularly in the bleeding due to the large, firm, myopathic uterus; (6) dilatation and curettage,

followed by atmokausis; (7) hysterectomy when other means have failed. With the present status of *x*-ray and radium treatment and atmokausis, hysterectomy is rarely needed except in cancer and degenerated fibroids.

Atmokausis is the cauterization of the endometrium by superheated steam at a temperature of 115°C. The apparatus consists of a boiler, with thermometer and safety valve; the outlet tube terminating in a uterine nozzle controlled by a three-way valve.

Technic of Atmokausis.—(1) The patient is prepared as for any vaginal operation, is arranged in the dorsal position and anesthetized.

2. The cervix is dilated to one inch if the two-branched dilator, or a circumference of 80 mm. if the four-branched Cleveland dilator is used, and the uterus thoroughly curetted, explored with placental forceps, and washed out with sterile water through an intra-uterine catheter.

3. Thirty-one cubic centimeters of hot water is introduced into the boiler of the atmokausis apparatus and the alcohol flame is started under the boiler.

4. The intra-uterine nozzle of the apparatus, sterilized by soaking in 5 per cent. carbolic acid solution, is screwed on to the handle, all the joints being tightened, and as soon as steam is generated, the stop cock is turned slightly to test the tubes and make sure the lumen is free.

5. The nozzle is then inserted into the uterine cavity, the point being near, but not touching, the fundus.

6. When the thermometer on the boiler registers 115°C. the steam is allowed to flow through the nozzle for ten, fifteen or twenty seconds, or as long as the individual case seems to require.

7. The uterus is then washed out again, and the patient returned to bed.

8. She should be left in bed ten days, and during her convalescence may require intra-uterine douches if a foul leukorrhea develops.

9. Repetition is rarely needed.

10. This form of treatment is absolutely contra-indicated in cancer or degenerated fibroids. Its field, like radium, is the myopathic uterus.

Zestokausis is the same except that the uterine nozzle is closed, and the steam does not circulate free in the uterine cavity. It is not as efficient.

Hysterectomy may be supravaginal (as in fibroids); complete (either abdominal or vaginal panhysterectomy) as in cancer; Supravaginal extraperitoneal (a variation of vaginal hysterectomy in which the cervix is left); partial fundal, to diminish the bleeding endometrial surface.

V. The Menopause (Climacteric, Change of Life)

This is reached as a rule at about forty-five years of age. In less than 1 per cent. does it occur before thirty-five or after fifty-five. It is reached earlier in working women than in the leisure class. The date is influenced by early childbearing, fibroid tumors, chronic pelvic congestion, climate, occupation and many other factors.

Mechanism.—The periods at first become irregular, then scanty and then cease entirely. The entire process is prolonged over two or three years. Rarely the menses cease abruptly and never reappear. After the menopause is established, all the genital organs, external and internal, show a process of atrophy.

Symptoms.—(1) Menses are irregular, then scanty and then cease; (2) hot flashes; (3) nervous irritability, dizziness and tendency to mental depression; (4) palpitation; (5) buzzing in ears; (6) often serious psychoses; (7) often marked increase in weight.

Many patients pass through the menopause with few if any disagreeable symptoms, but the first three mentioned above occur in the majority. Just before the climacteric there is usually a marked increase of sexual impulse, which disappears after the process is complete. The loss of ovarian secretion is

thought to be the cause of the menopause and its disagreeable symptoms.

The surgical menopause, following double oöphorectomy or hysterectomy is more severe in its manifestations than the normal, and the younger the patient the worse and more lasting the effects.

Treatment.—Unless the disagreeable symptoms demand relief, often no treatment whatever is required. In patients who require treatment, the following can be depended upon: (1) Mental suggestion. Reassure the patient as to her safety and that any nervous depression is merely temporary; (2) strontium bromid, 15 grains four times a day, with periods of remission as the nervous symptoms are controlled; (3) hypodermic, intramuscular injections of soluble extract of corpus luteum, or whole ovarian extract, given in doses of 1 mil (20 mg.) daily for twenty-four doses, repeated in series of twelve doses at intervals of several weeks. This is the most efficient of all treatments, and rarely are more than two series of doses required. The effect is cumulative. The natural menopause requires least; the surgical menopause late in life the next and the surgical menopause in young women the largest number of doses; (4) valerianates are not as efficient as strontium bromid. When used, the elixir of valerianate of ammonia, in teaspoonful doses, gives the most effect, but is objectionable as a rule because of its fearful smell.

Bleeding at the menopause is always pathologic, whether it be menorrhagia or metrorrhagia, the commonest cause being cancer, fibroids and polyps. Any abnormal discharge, whether blood, leukorrhea or a mixture of both, should be carefully investigated so that an early diagnosis of cancer may be established. The common belief that an excess of blood at the menopause is a normal feature is responsible for the large number of cancers that reach the physician too late for relief.

This applies with equal force to bleeding or abnormal discharge *after* the menopause is established.

Vicarious menstruation is the discharge of blood from other body canals, at the normal menstrual time, without any uterine flow. It is commonest from the nose, but may occur from any mucous surface, such as stomach, intestine, lungs or rectum. Very rarely skin areas are affected showing ecchymoses. The vicarious periods are likely to be irregular and may alternate with periods of normal flow.

The *cause* is unknown.

Treatment.—Beyond correction of any pelvic disease or uterine displacement; iron arsenic and strychnin if anemic; the hypodermic injections of corpus luteum or whole ovarian extract, nothing can be done.

CHAPTER XVII

LEUKORRHEA (THE WHITES)

Definition.—Leukorrhea is an abnormal discharge from the female genital tract, consisting as a rule of mucopus, but may be mucus, pus, serum or combinations of these.

Sources.—1. *Vulva:* Gonorrheal infection of Skene's ducts, the urethra and Bartholin's glands account for most cases. It is common in children, and in the aged, in the latter especially with diabetes.

2. *Vagina.*—Vaginal leukorrhea is not common. The modified skin with which the vagina is lined resists bacterial infection. Many apparent cases of vaginal leukorrhea originate in Skene's ducts, urethra, or Bartholin's glands. Vaginal discharge in childhood is more common than in the adult, due to the susceptibility of the vaginal mucosa to gonorrheal infection.

In the adult, the commonest causes are: (1) Saprophytic or fungus infections; (2) senile vaginitis (when the discharge is very white, due to degenerated epithelium); (3) neglected pessaries, especially soft rubber ones; (4) neglected gonorrhea; (5) carcinoma.

3. *Cervix.*—This is the commonest source of leukorrheal discharge. The normal cervical discharge is a clear mucus and hardly appreciable. When the cervical glands are infected or irritated, they pour out large quantities of mucus, so that the patient must wear napkins for protection.

The causes of cervical leukorrhea are: (1) Laceration of the cervix; (2) erosion; (3) eversion; (4) gonorrhea (of all the most stubborn to treat); (5) carcinoma; (6) non-bacterial hypersecretion of the cervical glands (most often in virgins and often without obvious cause; though usually in neurotic pa-

tients and those with displacement of the uterus; (7) cervical polyps.

4. *Uterus.*—The endometrium is not prone to infection and discharge. *Causes* of uterine leukorrhea are: (1) Chronic interstitial endometritis (after sepsis or gonorrhea); (2) chronic hyperplastic glandular endometritis (though bleeding is commoner); (3) senile atrophic endometritis; (4) incomplete abortion; (5) sloughing polyps; (6) cancer; (7) tubercular endometritis. There is a temporary leukorrhea just preceding or following menstruation and due to hypersecretion and hyperemia; it is so common as to be physiologic.

5. *Tubes.*—Hydrosalpinx (hydrops tubæ profluens) and pyosalpinx (pyosalpinx profluens) sometimes discharge through the uterine cavity, at intervals; but other than this the tubes play no part in leukorrheal discharge.

Characteristics of Leukorrhea.—The normal vaginal reaction is *acid;* in leukorrhea the reaction is usually *neutral* or *alkaline.* The *quantity* of discharge is greatest from the cervix, and least (except in vulvovaginitis in children) from the vagina. The *consistence* varies from a thin watery discharge (as in early carcinoma of the cervix) to a profuse creamy ropy mucopus. The discharge varies in *color,* from clear mucus to white, yellow, red, green (sloughing fibroids) to dark brown or black. As a rule the thinner and more watery the discharge, the more persistent; the commonest exception to this is chronic gonorrheal endocervicitis. It is often blood-stained, most commonly in cancer, fibroid polyps or senile vaginitis.

A foul discharge is rare in ordinary leukorrhea; it is the rule in: (1) retained products of conception; (2) cancer; (3) sloughing polyps or fibroids; (4) neglected pessaries.

Bacteriology.—By far the commonest organism is the gonococcus, especially in adults who have not borne children. In parous women, the injuries of childbirth, with non-gonorrheal bacterial invasion, is the most common cause.

Streptococci, both aërobic and anaërobic; staphylococci, colon bacilli, gram-negative anaërobes, tubercle bacilli, and

pneumococci are the commonest non-gonorrheal organisms. All these are of low virulence, except after miscarriage or labor at term.

Diagnosis as to source is made as follows: 1. Inspection of the vulva for (1) abscess of Skene's glands; (2) urethritis; (3) infection of Bartholin's glands. 2. Inspection of the entire vaginal wall, through a skeleton bivalve speculum made of wire, so that as little as possible of the vaginal walls is hidden from view. 3. Inspection of the cervix through the same, or a solid bladed bivalve speculum, for erosion or eversion, polyps or cancer. 4. Bimanual examination of the uterus, tubes and ovaries, to detect enlargement, tumors, fixation or pelvic inflammation. 5. If no cause is found as above, and especially if the patient is nearing the menopause, exploratory dilatation and curettage, with microscopical examination of the scrapings. 6. Smears are always taken from the urethral and cervical discharge.

Treatment is best considered by sources.

General Treatment.—The patient's general health should be considered, her mode of life, bowels and diet regulated, and iron, arsenic and strychnin given when she is anemic.

1. *Vulvar Leukorrhea.*—The vulvar lesions responsible for the discharge are nearly always gonorrheal in origin. Infected Bartholin's glands are dissected out; infected Skene's tubules injected with nitrate of silver 8 per cent., or argyrol 25 per cent. or silvol 5 per cent. by a hypodermic syringe with a blunt needle; or much better destroyed by the electric cautery needle or slit up; an infected urethra is treated by local applications. Unless these lesions are removed, other local treatment is useless. A chronic urethritis is usually due to infected Skene's glands.

2. *Vaginal Leukorrhea.*—Vulvovaginitis in children has been considered in Chapter XV on gonorrhea. The treatment of neglected pessaries, tampons or other foreign bodies is obviously their removal, followed by douches of salt solution twice daily until the erosions caused by the foreign bodies have

healed over. If the patient is of uncleanly habits, and the discharge results from saprophytic or fungus infection, douches twice daily or mild antiseptics like lysol 1 dram to 2 pints, or boric acid gr. 10 to oz. 1, or permanganate of potassium 1–3000 are all that will be needed. Cancer is treated by surgical means if possible; if far advanced by *x*-ray or radium.

Senile vaginitis, associated with a white or yellow, often blood streaked discharge, and accompanied by intense itching resists all ordinary local applications or douches. In these cases, the following will help most cases: (1) Swabbing the entire vaginal mucosa, with 7 per cent. tincture of iodin. Care must be taken not to let any excess of solution run down over the perineum or anus, as it will then cause intense burning. This application must be repeated several times at intervals of a week, as the patient's condition indicates. (2) Eight per cent. nitrate of silver solution (gr. 40 to the ounce) used in the same way. (3) Implantation of lactic acid bacilli, as follows: (*a*) The patient is arranged in the dorsal position, the vagina thoroughly cleansed with salt solution, and dried; (*b*) the cervix is exposed with a bivalve speculum; (*c*) a lactic acid tablet, with lactose base, is moistened with sterile water (one or two drops only) and inserted in the posterior vaginal vault; (*d*) the speculum is half withdrawn, and after five minutes, withdrawn completely; (*e*) no douches are allowed; (*f*) fresh applications are made at weekly intervals for three or four weeks, until the vaginal secretion is acid, and then about once a month.

This treatment is most efficient in senile vaginitis, next in ordinary mild vaginitis, next in chronic endometritis, and least of all in vulvovaginitis in children.

(4) Routine douches, or local applications, except as noted above, are a waste of time.

Mild vaginitis (not senile) responds to the following: (1) Hot douching twice daily of boric acid (gr. 10 to oz. 1) or potassium permanganate 1–3000; (2) drying vagina with cotton and insertion of vaginal suppositories containing three grains

of hydrastis; this is done nightly; (3) powder of aluminum acetate, one part; talcum two parts, boric acid three parts, applied on tampons or by insufflation.

(3) *Cervical leukorrhea* is much the most stubborn to treat, especially if due to gonorrheal endocervicitis. The treatment naturally varies with the cause. A lacerated cervix must be repaired, and the erosion and eversion dependent upon the tear will disappear. Cancer requires cauterization, radium or panhysterectomy. Leukorrhea due to cervical polyps is easily checked by removal of the polyp. Erosion not due to laceration or gonorrhea, responds quickly to 8 per cent. nitrate of silver. The real problem is presented by chronic endocervicitis, particularly the gonorrheal type.

Gonorrheal Type of Cervical Leukorrhea.—(1) Dry treatment, by aluminum acetate, talcum and boric acid, applied thickly dusted on tampons. (2) Tampons of boroglycerid 25 per cent., or ichthyol 50 per cent. in glycerin, removed at forty-eight hour intervals. (3) Local applications, on cotton swabs through a bivalve speculum, of argyrol 25 per cent., protargol 5 per cent., silvol 5 per cent., all made up in glycerin; tincture of iodin 7 per cent.; pure formalin, 40 per cent. solution of formaldehyd; iodin 7 per cent., carbolic acid pure, equal parts. These applications are made with uterine applicators thinly wound with cotton, saturated with the solution to be used and carried up to the internal os The solution is then made by rotating the applicator, always in the direction the cotton has been wound on it. The last three are the most efficient, but likely to be painful, and a cotton pledget should be packed in the posterior vaginal vault to protect against leakage. These applications are made twice weekly, over periods of several weeks. (4) Electricity with copper uterine electrode, positive pole to the uterine sound, using a 40 milliampere galvanic current for forty-five minutes twice weekly. (5) Instillations into the cervical canal of 5 per cent. silvol or 25 per cent. argyrol or 50 per cent. ichthyol pastes, made with a slowly soluble base and injected by means of an instillating syringe. For technic

see Chapter VI. (6) *Radium*—50 mg. screened by 1 mm. platinum or brass and encased in a finger-cot, inserted to the level of the internal os. The external os is closed by a suture, which includes the end of the finger-cot; the radium is removed after eighteen hours. (7) Vaccines—mixed autogenous, so as to be representative of the vaginal flora. (8) Brewer's yeast, ½ ounce poured in the vagina and held in by a large wool tampon for twenty-four hours sometimes works well, but is not to be depended upon. The same is true of lactic acid bacilli tablets, as described under senile vaginitis. (9) Vaginal douching, except for cleanliness, is useless. (10) Stubborn cases will require surgical relief, either Schröder's operation of excision of the mucosa (likely to be followed by a secondary dysmenorrhea from stenosis) or much better amputation of the cervix at the level of the internal os. This latter is efficient, but any future pregnancy is very liable to abort.

(4) *Uterine leukorrhea* is uncommon. The treatment varies with the cause. Senile atrophy of the endometrium, if a cause of discharge requires dilatation and curettage and application to the uterine cavity of tincture of iodin 7 per cent. and pure carbolic acid equal parts, but this should rarely be needed. Incomplete abortion is cleaned out with placental forceps; cancer requires hysterectomy; sloughing fibroid polyps are removed by dilatation of the canal and placental forceps.

Dilatation and curettage for gonorrheal infection is to be avoided as it is very likely to result in a pyosalpinx. The best treatment, locally, for uterine leukorrhea, except for cases due to cancer or tuberculosis, is instillation into the uterine cavity of 25 per cent. argyrol, 5 per cent. silvol or 5 per cent. protargol, prepared in glycerin. Vaginal douches are useless, except for cleanliness.

(5) *Tubal leukorrhea* comes only from hydrosalpinx or pyosalpinx, draining through the uterine cavity and requires abdominal section and removal of the affected tube.

(6) *Leukorrhea in virgins* is most commonly due to displacement of the uterus or anemia (chlorosis) and on correction of

the primary cause will disappear. When it occurs without demonstrable cause, the treatment is:

(1) Iron and arsenic tonics; (2) laxatives, to produce two soft movements a day; (3) ergotin gr. ½, pituitrin ½ mil hypodermically daily for five or six doses, to diminish uterine congestion; (4) in chronic cases, dilatation of the uterine canal and application of tincture of iodin and carbolic acid equal parts, to the uterine cavity.

Prognosis.—Many cases of leukorrhea respond promptly to treatment; many are distressingly chronic, especially chronic gonorrheal endocervicitis. Relapses after apparent cure are common.

CHAPTER XVIII

DISEASES OF THE BREAST

I. ANOMALIES OF DEVELOPMENT

Absence (Amazia).—The breasts are never microscopically absent. While there may be no gross evidence of any gland tissue, it is said that traces may always be found, by microscopical examination. This is, of course, of no clinical importance. Incomplete development is called *micromazia.*

Supernumerary breasts (polymazia) are not uncommon. In the embryo of six weeks, there is a line of cells running from the axilla to the groin—the *crista lactea.* From the thoracic portion of this the breasts are developed. The extension of the crista lactea into the axilla is the most frequent site of accessory breasts, though they may be situated anywhere. Each gland may have its own nipple and secrete milk during lactation. The "swollen gland in the axilla" complained of by so many patients after delivery, is simply an accessory breast.

Supernumerary nipples are known as *polythelia.*

II. ABNORMALITIES OF THE NIPPLE

Although many of the abnormalities mentioned in this chapter are met chiefly as complications after delivery, the author has thought it best to include them in this place, rather than limit the subject to those remote from child-birth.

The most important of the abnormalities of the nipple are (1) Fissured or cracked nipple; (2) inverted; (3) stunted; (4) hollow; (5) mulberry; (6) conical; (7) mushroom.

The inflammation of the nipple, associated with fissure, is called *mammillitis.*

Fissured nipple most often occurs in pregnancy, or the puerperium, from lack of cleanliness or rubbing of clothing. It is rare at other times.

It is most common during lactation, in primiparæ, in blonds or red-haired women rather than brunettes and in any deformity of the nipple itself. If the condition occurs in pregnancy, cleanliness and protection by a leaden nipple-shield will usually suffice.

FIG. 141.—Faulty development of the nipple. (*Dickinson.*)

Symptoms.—(1) Intense pain on nursing and (2) a visible crack in the skin. This fissure usually runs around the base of the nipple, at its lower border, but may occur as a vertical fissure dividing the nipple or as an ulcer anywhere on its surface. If not easily visible, a reading magnifying glass should be used to search for it. In any case of painful nursing, a fissure should be looked for, at once. The fissure often bleeds when the child is nursed, and if this blood is swallowed by the child, it will appear in the stools—*melena spuria.*

Treatment.—If the nipples are sore in pregnancy, and no

actual fissure is visible, they should be kept scrupulously clean, protected by a leaden nipple-shield and witch-hazel applied to them twice daily.

If the fissure appears during lactation, scrupulous cleanliness is imperative. The nipple is protected during nursing by a nipple-shield (either the Phoenix or Infantibus—the latter much the best). The nipple is washed off with boric acid solution before and after each nursing. After nursing dry and equal parts of subnitrate of bismuth and castor oil is applied.

FIG. 142.—Leaden nipple-shield. (*B. C. Hirst.*)

FIG. 143.—Nipple-shield. (*Phoenix.*)

All these applications are made with sterile cotton pledgets. The nipples are then covered with sterile gauze and a Murphy breast binder applied. Alternative applications are compound tincture of benzoin, applied to the fissure itself; ichthyol 1 dram in 1 ounce each of glycerin and olive oil; solid stick nitrate of silver to the fissure.

It is not safe for the child to nurse without the protection shield until forty-eight hours after the fissure has apparently healed. Should the fissure refuse to heal, or the child be unable to nurse from the shield, a teterelle (or Phoenix number 3) should be used.

This is a form of breast-pump in which the mother, by a rubber tube and mouth piece makes the necessary suction to draw the milk into the pump, and the child withdraws it by a separate orifice and tube. This instrument can be used over

long periods, with little danger of causing pain, and for this reason is preferable to any other form. As the mother regulates the amount of suction, and can stop short of any degree that is uncomfortable, there is little chance of reopening a fissure that is healing. If this will not work satisfactorily, the child must be weaned.

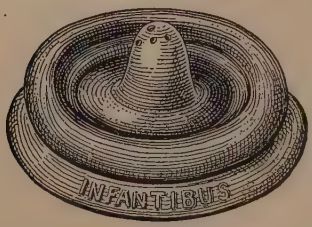

FIG. 144.—Soft-rubber nipple-shield called "Infantibus" will be tolerated in cases of sensitive nipples when the "Phoenix" and others cannot be endured. (*J. P. C. Griffith.*)

Care of Nipple-shields.—Shields must be washed and scalded directly after use, and kept in a closed jar of boracic acid solution (gr. 10 to oz. 1) so that they are completely covered by the solution. The shield is removed from the solution with dressing forceps, and rinsed in cool sterile water just before use.

Danger of fissured nipple is chiefly infection and breast abscess.

Inverted nipple is an arrest of development. It is of importance in lactation only. Long-continued use of the breast-pump in pregnancy, with moderate suction, will help somewhat, suction being applied for fifteen to twenty minutes night and morning. The condition is usually obstinate. Massage with the fingers is somewhat dangerous, due to bruising and infection. The breast-pump is more efficient and safer. Inverted nipples are difficult to keep clean during lactation. They are likely to fissure, and it is impossible for the child to nurse without a nipple-shield or a tetrelle.

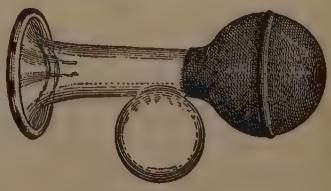

FIG. 145.—Breast-pump. (*Phoenix.*)

Stunted nipple is important only in that it is difficult for the child to nurse. Systematic use of moderate suction with a

breast-pump, throughout pregnancy, will often cause improvement, but the nipple-shield is usually required during the nursing period.

Hollow nipples are merely a form of inverted, have the same disadvantages and are treated in the same way.

Mulberry nipples are exceedingly likely to fissure and require care to prevent this complication. If a fissure occurs, it is treated as already described.

Conical nipples make it somewhat difficult for the child to nurse, but the difficulty is not a serious one, and a nipple shield is rarely required.

Mushroom nipples have the same disadvantages as mulberry —fissure—though to a less degree.

All the above complications are those of pregnancy and lactation, and rarely if ever give trouble at other times.

Abscess of the areola is most commonly seen in girls about puberty, though it can occur at any time. It arises from the sebaceous follicles, and requires incision and drainage.

Paget's disease (Malignant Dermatitis), is a chronic, destructive inflammation of the nipple, seen usually in women past forty-five.

Cause is unknown.

Symptoms.—(1) Moist desquamation, followed by yellow purulent discharge, with formation of crusts. (2) Under the crusts, the surface is red and raw. (3) The nipple is retracted or destroyed, and the condition often extends, like an eczema, to the skin of the breast. It is a precursor of carcinoma of the breast.

Treatment is excision of the diseased area, and, if there are any indurated areas in the breast, removal of the breast and axillary glands. This operation, like those for known carcinoma, should be followed by *x*-ray treatment as a prophylactic.

III. NON-INFLAMMATORY DISEASES OF THE BREAST

1. **Hypertrophy** is rather rare. It is bilateral and usually asymmetrical, the condition is most often (80 per cent.) seen

in women under twenty-five years of age. The breasts may be very large—one of sixty-four pounds being reported. The enlargement is usually a fibrous tissue growth, and during lactation, a profuse flow of milk is not the rule. Nursing the child has been a cause of reduction in size of the glands, hence it is not contra-indicated.

The process is benign, and if the weight is burdensome, a supporting binder or, failing this, amputation are the only remedies.

2. **Neuralgia of the breast** (mastodynia) is most common in young unmarried women, and is often associated with disturbance of ovarian secretion and menstrual irregularities. The skin is hyperesthetic, the breast is tender to the touch, but no organic change can be detected.

Treatment is: (1) Iron, arsenic and strychnin as tonics; (2) hypodermic injections of whole ovarian extract, 1 mil daily for twenty-four doses, followed by series of twelve doses at intervals of several weeks.

IV. INFLAMMATORY DISEASES OF THE BREAST

Acute inflammation (mastitis) is most common in nursing mothers. It occurs occasionally in infancy (in both girls and boys) and at puberty in girls, as enlargement, induration and tenderness, persisting for several weeks and finally undergoing resolution, though suppuration sometimes takes place. Mastitis is also seen as a metastatic process in mumps.

The pus may be in the areola, the subcutaneous connective tissue, the gland itself and the connective tissue under the breast. The commonest type is infection of the gland, with secondary involvement of the connective tissue. The bacteria responsible are *Staphylococcus albus* or *aureus*, *Streptococcus pyogenes*, pneumococcus, colon bacillus, or *Oïdium albicans*.

Cause.—Dirt in handling, whether from hands, cloths, water, clothes or various applications, is the chief cause. The widespread superstition among the lower classes that saliva is the best application for fissured nipple is responsible for many

cases. The skin of the areola and nipple always contains pathogenic germs, and these may develop powers of invasion, through the ducts (this will explain the cases due to bruising in massage). The child may be the source of infection, if it has thrush or stomatitis.

Symptoms.—A chill and moderate fever (103°) most commonly from the tenth to twentieth day of the puerperium. The breast is painful, and one or more indurated areas can be felt.

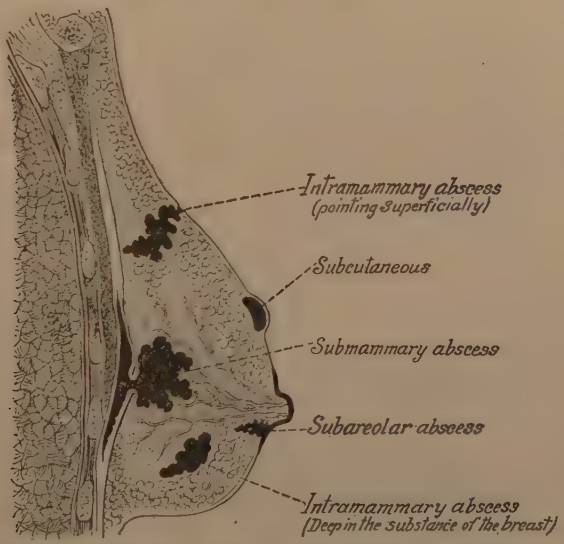

FIG. 146.—Location of pus in a breast abscess. (*After Deaver.*)

The commonest portion affected is the outer lower quadrant. The temperature and pain usually subside within thirty-six hours; if they continue, suppuration is to be expected.

Treatment.—(1) If the breast is engorged, massage is indicated, otherwise not. In any case it must be gentle; (2) purgation with hydragogue cathartics; (3) breast-binder; (4) ice bag over affected area; (5) applications of saturated magnesium sulphate solution or dilute lead-water and alcohol (two ounces lead-water to three ounces of alcohol); (6) strap-

ping with adhesive straps, if the extra pressure is not too painful. This treatment is to be used only *before* suppuration is evident, and is often spoken of as the "abortive treatment." Bier's local hyperemia, by suction caps, is painful and ineffectual. It is used with suction for four-minute periods, with equal periods of rest, for forty-five minutes once daily. The results do not justify its use.

Breast abscess is a common sequel of mastitis. As the area involved in the suppurative process is, at first, small, but tends rapidly to infiltrate the entire breast, it is important to recognize the presence of pus as soon as possible. A breast abscess is nearly always multilocular and fluctuation is *not* to be awaited. The pus is located above, usually in, or under the gland.

Symptoms at first are indefinite. Pus may be expected with the following signs: (1) A dusky red or purple hue of the skin over the indurated area; (2) edema of the skin over the indurated area; (3) fever of an irregular septic type; (4) leukocytosis (18,000 to 22,000 on the average).

Differential diagnosis may be needed, in rare instances, from carcinoma of the breast, tuberculosis of the breast or actinomycosis. There is a type of carcinoma of rapid growth, first appearing in late pregnancy or early puerperium, called *mastitis carcinosa.* This, as well as tuberculosis or actinomycosis, requires microscopic sections of an excised portion, for accurate diagnosis.

Treatment.—Early opening of a breast abscess is imperative, before wide destruction of the gland has taken place. The technic is as follows: (1) General anesthesia. (2) Local surface cleansing as for any operation. (3) With a thin-bladed knife, make multiple stab wounds, about one-quarter inch long, opening every area where pus is suspected, and wiping off blade of the knife with an alcohol pad, after each incision. These incisions are to be made radiating from the nipple, so as not to cut across a milk-duct; they should be entirely within or without the areola, and not across the border (as in healing

the pigment will follow the scar); the incisions should be so planned that when the patient is out of bed, all drainage tubes will run down hill, and not straight across the breast; and it is desirable to confine all incisions, if possible, to the lower half of the breast. (4) A long hemostat is inserted through each opening, and the septa between the lobes of pus broken down, so as to make as nearly as possible a unilocular abscess. (5) Each opening is flushed out with sterile water, run from a fountain syringe by gravity. (6) Each pair of openings is then connected by fenestrated rubber drainage tubing, about the size of a lead pencil. The tubing is pulled from one opening to the other by the hemostat or clamp. Care is taken not to run the tubes superficially (as they will slough out and make ugly scars) or under the nipple. (7) Safety pins are passed through each end of each tube. (8) The tubes are flushed with sterile water, to be sure they are patent. (9) The breast is dressed with bunched gauze and a breast binder. Bandages or straps are a nuisance.

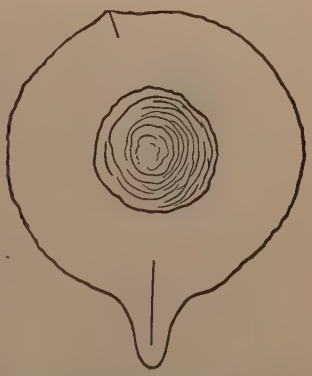

FIG. 147.—Pigment of the areola following incisions. (*Richardson.*)

The *Bier hyperemia treatment* is a failure in the ordinary breast abscess. It is fairly effective in small single abscesses, but a much easier, quicker and less painful way to cure a small unilocular abscess is to make a single small incision over the most prominent part of the swelling, wash out the pus, and inject a 2 per cent. solution of hegonon, or 25 per cent. argyrol, or 5 per cent. silvol. If the systemic symptoms of a breast abscess are severe, and the pus is streptococcic, intravenous injection of 80 to 100 mils of antistreptococcic serum is often of great value. The usual time of healing a breast abscess, properly opened and drained, is five to six weeks.

After-treatment.—The drainage tubes are flushed, once daily, with sterile water, run by gravity from a fountain syringe with a medicine dropper attached to the tube. Only if the tubes are blocked is a piston syringe used to force water through them, and as soon as they are clear, the gravity flow is substituted. No attempt is made to remove the tubes for at least two weeks, and then the shortest is removed first, and the others at two- or

FIG. 148.—Drainage required in a case of mammary abscess. (*B. C. Hirst.*)

three-day intervals; the sinuses are packed *lightly* with gauze, from each end, and flushed daily. Small secondary superficial collections frequently need opening during the convalescence. Unless the nipple ducts have been blocked, lactation in subsequent confinements is surprisingly little interfered with.

Postmammary abscess (submammary abscess) is a collection of pus in the connective tissue under the breast, just over the pectoral muscles. It is rare, and serious.

Symptoms.—One breast is more prominent than the other, the whole gland being lifted off the chest. There are no symptoms of inflammation in the breast itself, and very little pain on pressure. Systemic symptoms of sepsis are severe, fever high and leukocytosis 25,000 or more.

Diagnosis is best made by aspiration with a hypodermic syringe. The needle should be of fairly large caliber, as the pus is usually thick.

Treatment.—An opening is made at the most dependent portion, a counter-opening diametrically opposite, and through-and-through drainage established by a fenestrated rubber tube. The after-care is that of the ordinary breast abscess.

Chronic mastitis occurs in two forms:

1. *Lobar* (or circumscribed), usually following trauma or pregnancy. It is most frequent in women near the menopause. The lobe involved is enlarged, indurated and tender, but there is no systemic disturbance. It is exceedingly chronic, but never suppurates.

2. *Diffuse* (lobular or interstitial) is most frequent after lactation or at the menopause. The intercanalicular connective tissue increases very markedly, and later contracts, so that the breast is hard and shrunken, the seat of small cysts, and the nipple depressed. The breast is painful and there is a watery discharge from the nipple. The disease rarely disappears, but causes atrophy of the breast, with general cystic degeneration, and possibly carcinoma.

Treatment of both forms of chronic mastitis is: (1) Removal of any source of chronic irritation, such as badly fitting corsets; (2) support by a breast-binder; (3) local inunction of unguent. hydrargyri and unguent. belladonnae equal parts; (4) potassium iodid 15 grains four times a day; (5) amputation of the breast if exceedingly painful or the seat of gross pathological changes.

Chronic suppurative mastitis is distinguished by pus formation without signs of inflammation. It follows lactation, syphilis, tuberculosis and actinomycosis. The abscess wall is very thick, and the tumor feels solid, without fluctuation. The diagnosis is made by aspiration.

Treatment.—If small in extent, incision and drainage, if extensive, amputation of the breast.

Tuberculosis is uncommon. It may be localized (cold abscess) or diffuse (miliary). It is usually secondary. Sharply circumscribed areas can be excised, but as a rule amputation is required.

Syphilis is seen as mucous patches or condylomata of the nipple, or as gummata. The local manifestations disappear on systemic treatment.

V. TUMORS OF THE BREAST

Tumors of the breast are *benign* or *malignant.*

Method of Examination.—In palpating the breast for a tumor, the gland should not be picked up between the fingers, but *pressed against the chest-wall with the flat of the hand.*

Benign Tumors of the Breast

Fibro-adenomata are the most common benign tumors of the breast. Pure fibroma and pure adenoma are exceedingly rare. They occur between puberty and the thirtieth year. They are hard, nodular, freely movable, usually but not always painless and show no adherence of the skin, axillary involvement or effect upon the general health. They are subject to cystic degeneration, but rarely become malignant. They often grow rapidly in pregnancy.

Treatment.—(1) Semicircular incision along lower margin of breast; (2) breast is turned back and the growth removed by V-shaped excision; (3) the wound of excision is sutured, and if much tissue is lost, the gap can be filled in with fat transplanted from the thigh or buttock; (4) the skin wound is

sutured by subcuticular stitch, leaving provision for drainage of serum at one corner.

Cysts of the breast are (1) Retention cysts caused by blocking of the ducts (galactocele); (2) involution cysts (in interstitial mastitis and often papillary), usually bilateral; (3) interacinous cysts (from lymph-spaces and lined with endothelium. They have no connection with the gland spaces. A galactocele is round, painless, near the nipple and usually fluctuating. The

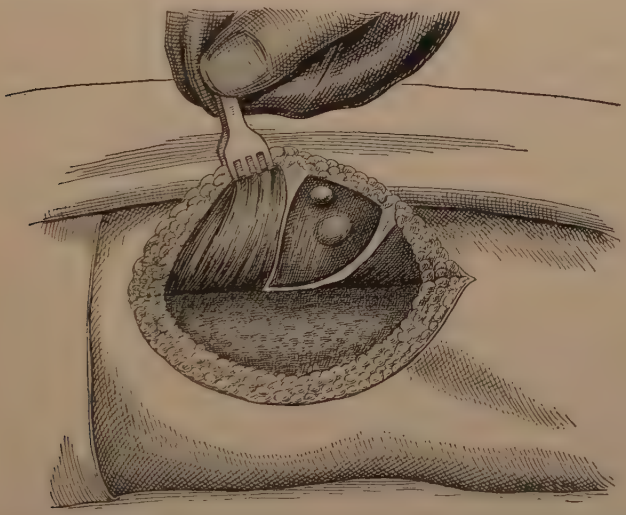

FIG. 149.—Removal of a breast tumor by elevation of the breast and wedge-shaped excision. (*After Warren.*)

treatment required is incision and drainage. Involution cysts require amputation of the breast. Interacinous cysts are dissected out, entire if possible. Any cyst of the breast should be looked upon with suspicion, even though the microscope shows no evidence of malignancy. They are often in the precancerous stage, and the patient should be kept under observation for several years.

Cystadenoma is the dilatation of the acini into multiple cysts. It occurs between the thirtieth and fortieth years, is slow in

growth, large in size, painless, and associated with bleeding from the nipple. It is nodular and encapsulated, hard, and in the later stages adheres to the skin even breaks through it. It does not as a rule involve the axillary glands.

Treatment.—In the early stage, removal of the growth alone; in the late stages, amputation of the breast.

Malignant Tumors of the Breast

1. **Carcinoma.**—*Frequency.*—Over 80 per cent. of all breast tumors are carcinoma. It is more frequent in women who have borne children. Any lump in the breast must be regarded as potentially malignant, until proven otherwise. Cancer is more frequent in the left breast than the right.

Age of Patient.—The majority are past thirty-five years of age. It may occur much earlier, but is unusual before thirty-five or past sixty-five.

Causes.—(1) Preceding trauma or inflammation; (2) Paget's disease; (3) heredity influence is slight.

The actual exciting cause is not known.

Kinds.—(1) Acinous; (2) columnar celled or duct cancer; (3) squamous-celled epithelioma.

Medullary or encephaloid cancer is soft, appears at an earlier age, grows rapidly, ulcerates early, gives early metastases, and the nipple is not retracted. This is the type which, owing to its often following pregnancy and being vascular, is mistaken for a breast abscess.

Scirrhous or *hard cancer* appears later, grows slowly, is stony, hard and nodular, the skin is adherent and infiltrated and the whole breast is movable as one mass; in the early stages perpendicularly to the milk ducts but not parallel to them; in the late stages, after the pectoral muscle has been involved, up and down but not transversely. As the fibrous septa of the breast contract, small depressions appear in the skin, giving it the appearance of orange rind or a pig's skin. This growth is most frequent in the outer segment of the

breast. The nipple is higher on the affected side, and the areola shrunken. A scirrhous cancer is never large and in old women sometimes shrinks progressively and lasts for years (atrophied scirrhous). If the skin is extensively infiltrated, it is called *cancer en cuirasse.*

Symptoms.—(1) A growth in the breast, answering one of the descriptions just given; (2) rapid growth if medullary, slow if scirrhous; (3) often a thin bloody discharge from the nipple; (4) pain is absent at first, but later is very severe, due to axillary involvement; (5) ulceration is preceded by a purple discoloration of the skin; (6) cachexia is a late symptom; (7) the axillary lymph-glands are involved early, and later, with the supraclavicular, become palpable; (8) solid edema of the upper extremity, caused by pressure on the axillary vein and lymph-vessels.

When ulceration takes place, the scirrhous ulcer has hard, uneven, everted margins, is deep and has an offensive bloody seropurulent discharge.

Diagnosis.—Any suspicious lump in the breast should be excised and examined microscopically. This is vitally important in all women past thirty-five. By the time a diagnosis can be established by symptoms alone, it is usually too late for a successful operation.

Metastasis takes place: (1) The axillary lymph-glands; (2) the supraclavicular lymph-glands; (3) the anterior and posterior mediastinum; (4) to the opposite breast and axilla.

Treatment is early and complete removal of the breast, pectoral muscles, axillary glands and fat and supraclavicular glands. The huge wound is closed by undermining of the skin and bringing the flaps together with interrupted silkwormgut sutures. The axilla is drained for forty-eight hours, by rubber tissue or a tube through a stab wound. If the wound edges cannot be brought together, the gap is allowed to granulate and skin-grafted later if necessary.

Inoperable cases are: (1) Those with extensive involvement of axillary or supraclavicular glands; (2) cancer en cuirasse;

(3) those with visceral involvement; (4) atrophic scirrhous cancer in old women.

Treatment.—(1) Local cauterization; (2) fulguration, usually under chloroform and *never* ether, because ether vapor is inflammable; (3) *x*-ray or radium, (4) morphin in doses sufficient to control the pain. The various cancer serums, cauterizing pastes; Coley's fluid, injection of drugs like pyoktanin, thiosinamin, methyl-violet are useless.

After-treatment.—Every case of cancer of the breast, should be treated, after operation, by *x*-ray as a palliative measure.

Prognosis.—In untreated scirrhous cancer, expectation of life is two or three years; in medullary cancer, eight to twelve months. After operation 20 per cent. remain well after three years. After operation, immediate edema of the arm on the same side is a favorable sign, showing complete removal of the lymphatics; late edema is unfavorable, due usually to recurrence. Surprising muscular action in the arm is preserved or acquired, even after most extensive operations. The mortality of the operation itself is less than 3 per cent.

2. **Sarcoma of the breast** forms less than 5 per cent. of breast tumors. Sarcoma appears usually between the ages of twenty-five and thirty; it is encapsulated, grows rapidly; is usually softer than cancer, causes distention of the overlying veins, does not invade the axilla until ulceration has taken place, but does give early visceral metastasis.

Kinds.—Equally divided between small round-celled and spindle-celled. Inflammation and suppuration are common.

Differential Diagnosis.—(1) As given above; (2) is more movable than cancer; (3) does not retract the nipple; (4) does not infiltrate or thicken the skin; (5) causes profuse hemorrhage from ulceration.

Treatment is the same as for cancer.

Prognosis is very grave. The vast majority die from recurrence or visceral metastasis.

CHAPTER XIX

DISEASES OF THE RECTUM

Diseases of the rectum are very much the same in both sexes, but the frequency of rectal complications in pelvic diseases in women renders a short synopsis of the commoner ones advisable in any work on gynecology.

Methods of Examination.—Rectal examination is best made with the patient in the Sims or knee-chest position, the latter particularly for specular and proctoscopic examination.

1. *Inspection* of the external parts for fistula, fissure, hemorrhoids bleeding or other discharge, and any other local condition. By having the patient strain, prolapse of the rectum becomes evident, as do internal hemorrhoids and some polyps.

2. *Digital examination* permits exploration of the rectum to the length of the finger only, about four inches. A rubber glove is essential. The index finger is anointed with vaselin, and gently inserted through the sphincter, at first forward and then back towards the sacrum. In this way, polyps, internal hemorrhoids, foreign bodies, stricture or any other internal abnormality may be felt. If pressure is made on the lower abdomen with the other hand, by pushing the bowel downward, the reach of the examining finger is slightly increased.

3. *Specula* for rectal examination are either cylindrical or bivalve. They are best used in the knee-chest position, but permit of a limited view only of the rectum. Light is reflected from a head mirror or headlight.

4. A *proctoscope* is merely a long cylindrical speculum (8 inches); a *sigmoidoscope* a still longer one (14 inches) both being provided with obturators and having an electric light at the distal end.

Technic.—1. The patient is arranged in the knee-chest or Sims position; anesthesia is unnecessary.

2. The instrument, with *the light removed*, is sterilized by boiling.

3. The light is inserted and connected, the obturator inserted, and the instrument greased with vaselin.

4. The instrument is gently inserted past the internal sphincter, the obturator removed.

5. If the rectum does not distend under atmospheric pressure a plug with glass window is inserted in the proximal end and by means of a hand bulb, the rectum is distended with air and the instrument passed to its full length.

6. The whole rectum is carefully inspected as the instrument is withdrawn.

7. Applications may be made to the rectal mucosa by long applicators, through the barrel of the instrument.

5. If the rectum is filled with bismuth mixture, or a solution of 10 per cent. thorium nitrate, the size and shape of the rectum and the presence of fistulæ or diverticula can be shown by *x*-ray.

I. CONGENITAL MALFORMATIONS

During development, the gut and genito-urinary canal open into a common passage, the *cloaca*. Later the perineum is formed, by the growth of a posterior and two lateral folds, and the gut provided with its separate outlet. The *proctodeum* is a depression extending in from the perineum, until it meets the rectum, and marks the site of the anus. Errors in development cause the following: (1) Imperforate anus, where the rectum is complete but the proctodeum is absent; (2) imperforate rectum, where the rectum and proctodeum are both developed but do not meet; (3) absent rectum, where the rectum ends high up under the pelvic brim. All these must be corrected immediately after birth, as they are fetal complications, and have no place in the adult; (4) an imperfect septum dividing the cloaca, results in the rectum opening into the bladder (anus vesicalis); urethra (anus urethralis); or the vagina (anus

vaginalis or vestibularis). These abnormalities are usually corrected during infancy or childhood and are rarely seen in adult life.

II. FISSURES OF THE ANUS

This is often a complication of hemorrhoids, fecal impaction and passage of hardened feces, or proctitis.

Symptoms.—(1) Burning pain on defecation, and often on coughing or sneezing; (2) often a single "sentinel" pile at its outer extremity; (3) streaks of pus or blood on the fecal column when it is passed; (4) constipation encouraged because of the pain of a movement; (5) spasmodic contraction of the sphincter.

Diagnosis.—By separating the folds of the anus the fissure can usually be seen. If not, the patient is examined with a bivalve rectal speculum.

Prognosis.—May heal spontaneously. Some are chronic ulcers which persist for long periods.

Treatment.—(1) As an office measure, cocainize the fissure with 10 per cent. cocain solution and apply the solid stick nitrate of silver; repeated three times weekly until the pain on defecation disappears; (2) laxatives sufficient to give two soft movements daily; (3) if the above fails, the patient is anesthetized and the sphincter forcibly dilated, with the thumbs. During the resulting paralysis for five or ten days, the ulcer usually heals; (4) coexisting piles should be removed at the same time. If there is any difficulty, in office treatment, in exposing the fissure, pressure by the forefinger in the *vagina* can be used to evert the rectum through the sphincter. For this the patient is in the *right* Sims' position, so that the left hand is used for everting and the right for application; (5) a large ulcerated fissure may require excision, but this is rare.

III. FISTULA IN ANO

Fistula in ano is nearly always caused by the rupture of an abscess, the sinus refusing to heal because of poor drainage, tortuous course and constant reinfection from the bowel.

About one-half the cases are tubercular.

There are three kinds of fistulæ:

1. **Blind External.**—A sinus, which opens externally but does not communicate with the bowel. It is short and near the anus when due to an anal abscess; deeper and further from the anus when due to an ischiorectal abscess.

2. **Blind Internal.**—Also a sinus, which opens into the bowel, but has no opening on the skin externally. It is the rarest, and is usually on the posterior or lateral wall of the rectum.

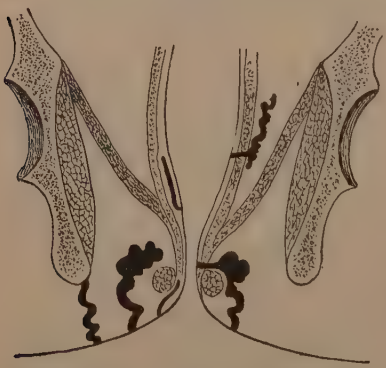

FIG. 150.—Forms of rectal and anal fistulæ. Blind internal, blind external, and complete.

3. **Complete.**—With an opening both external and internal occurs in 75 per cent. of cases. It is usually due to an ischiorectal abscess, the internal opening being about one and one-half inches from the anus.

Symptoms.—(1) Pain during defecation; (2) tenesmus; (3) purulent discharge; (4) in complete cases, escape of gas and feces through the fistula; (5) often recurrent abscesses, due to blocking of the tract and re-infection. As these often rupture through new tracts, they cause branching of the sinus.

Diagnosis is made by inspection and probing if the fistula has an external opening; by rectal speculum and digital exploration if it is blind internal. By digital examination can be felt spasm of the sphincter, the cord-like tract of the fistula and sometimes its orifice.

Treatment.—(1) Always examine lungs for phthisis and if present and active, avoid operation if possible; (2) patient is arranged in the lithotomy position and anesthetized; (3) a grooved director is passed through the fistula into the rectum, between the two sphincters; (4) the overlying tissues are cut through, the external sphincter cut *once* at right angles to

its fibers. Incontinence need not be feared, provided the internal sphincter is not cut, and the external cut but once; (5) all branching sinuses are opened, and all hard cicatricial tissues cut away with scissors; (6) the bleeding is checked and the wound packed with iodoform gauze; (7) blind fistula are best converted into complete fistulæ, and healed as described; the grooved director should always be brought out between the two sphincters; (8) the bowels are kept locked with opium suppositories for four days; (9) on the fourth day, the patient is given an ounce of castor oil, and when a desire for evacuation occurs, the packing is removed and she is given one-half pint of sweet oil by enema; (10) after each defecation the packing is removed, the wound irrigated, and the packing replaced; (11) time of convalescence is about three to four weeks. If the fistula is lined with mucous membrane, it must be completely excised. The internal sphincter should never be cut, and if the fistula opens into the bowel above the internal sphincter, its lower portion only should be dissected out.

IV. FOREIGN BODIES IN THE RECTUM

Foreign bodies are occasionally found, having been inserted by degenerates or insane persons, or have been swallowed. Symptoms are tenesmus, bleeding (due to ulceration) and obstruction varying with the size of the foreign body.

Diagnosis is made by digital examination, speculum or *x*-ray.

Treatment.—Removal by finger or forceps, through a speculum, usually under anesthesia. Large bodies may require splitting of the anus.

V. HEMORRHOIDS (PILES)

Hemorrhoids are varicose veins about the lower end of the rectum.

Kinds.—(1) *External hemorrhoids* at the margin of the anus are covered with skin. They originate from the inferior

hemorrhoidal plexus, and consist of varicose veins, surrounded by connective tissue. They are likely, especially in labor, to become inflamed, painful and thrombotic.

2. *Internal hemorrhoids* originate from the superior hemorrhoidal plexus, are covered by mucous membrane, and consist of varicose veins, connective tissue and a few small arterial twigs. They are likely, under straining, to protrude through the sphincter, which then closes down and strangulates them.

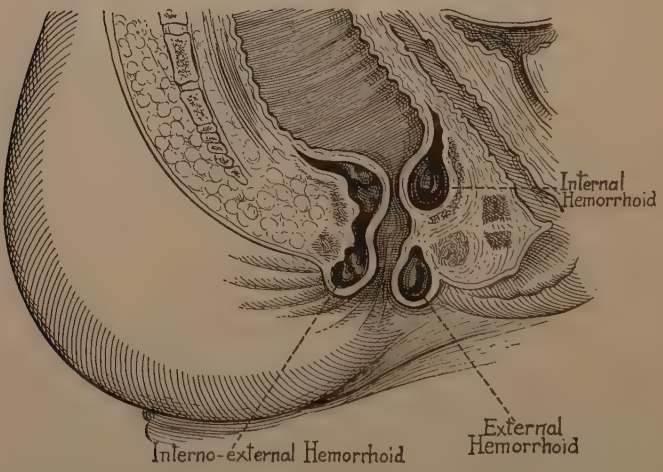

FIG. 151.—Location of hemorrhoids. (*After Pennington.*)

External and internal hemorrhoids often co-exist in the same case.

Causes.—(1) Chronic constipation, with its attendant straining at stool, is much the commonest cause; (2) laceration of the perineum, rectocele or prolapse of the uterus; (3) any cause (such as pelvic inflammation, obstruction to the portal circulation, rectal disorders) which produces chronic pelvic congestion; (4) they are the rule, though often temporary, in pregnancy.

Histology.—The veins run longitudinally between the

mucosa and the muscle, and form a complicated plexus above the anus. They have no valves, and are one of the principal communications between the portal and systemic circulations.

Symptoms.—*External hemorrhoids* cause few symptoms, other than slight itching, unless they become inflamed. Then they are distended, tense, bluish masses, painful to the touch, and they cannot be emptied by pressure. Repeated attacks of inflammation cause permanent thickening of the pile.

Internal hemorrhoids (bleeding piles) cause: (1) Pain, worse on defecation and in direct ratio to the degree of constipation; (2) sense of fulness in rectum at all times; (3) bleeding usually slight but may be very severe; (4) usually a mucous discharge; (5) when inflamed, they project through the sphincter and are intensely painful; (6) ulceration is common.

Diagnosis.—External hemorrhoids are obvious on inspection.

Internal piles are often made visible by straining, can be felt by digital examination or seen through a speculum. By placing the patient in the Sims position, the forefinger can exert sufficient pressure through the vagina to roll the entire anal canal out through the sphincter, into view, especially if the patient is asked to strain at the same time.

Treatment.—*External hemorrhoids*, when not inflamed, require: (1) Laxatives; (2) washing the anal region after each defecation; (3) the use of soft paper or cotton directly after defecation; (4) local application of witch-hazel and water equal parts. If they are inflamed and thrombotic, they must be incised, evacuated and packed, under anesthesia.

Internal Hemorrhoids. Palliative Treatment.—(1) Laxatives. (2) Bland diet, with avoidance of highly spiced food or alcohol. (3) Cleanliness as described above. (4) Local applications, two very satisfactory examples of which are the following:

Ext. hamamelis, fld. oz. 1
Ext. hydrastis fld.
Tinct. benzoin comp. āā oz. ½
Tinct. belladonnæ dram 1
Ol. olivæ (carbol. 5 per cent.) q. s. ad. oz. 3

Apply frequently, both externally and internally (Adler)

Cocain hydrochlorat gr. 10
Unguent. galli (nutgall)
Unguent. belladonnæ āā oz. 1

Apply thickly, with finger protected by finger-cot, inside rectum, four times a day.

The latter is the most useful, if there is much pain. (5) Whenever the piles prolapse, they should be replaced, with the finger protected by glove or finger-cot.

Operative Treatment.—Is indicated when: (1) Excessive pain; (2) excessive or prolonged bleeding; (3) repeated strangulation; (4) ulceration; (5) repeated inflammation.

Preparatory treatment for operation consists of: (1) Laxative—not purge, forty-eight hours before operation; (2) enemas thirty-six, twenty-four and twelve hours before operation; (3) paregoric drams 2, two hours before operation; (4) regular preparation for anesthesia.

Operation.—(1) Injection of boiling water, done under local anesthesia (10 per cent. cocain), several drops being injected, by a hypodermic, into each pile at intervals of a week.

(2) Injection of two drops of 10 per cent. carbolic acid solution, in the same way. These two can be used as office treatment, but are not routinely efficient.

3. *Clamp and Cautery.*—(1) The patient is arranged in the Sims or dorsal position and anesthetized; (2) the sphincter is thoroughly dilated; (3) a pile is caught with hemostatic forceps and pulled down; (4) a Smith's clamp, with ivory base next to the mucous membrane, is applied and screwed tight; (5) the top of the pile is removed with scissors and the base seared with a cautery at a dull red heat (too much heat causes hemorrhage); (6) the clamp is removed and all other piles are treated in the same way. The Downes electrothermic angiotribe is a neat instrument for applying heat and pressure simultaneously. The pile is brought down in the same way, the clamp applied and the special guard underneath it. Wet gauze is then placed

under the clamp and protector and the current turned on for thirty seconds, counted from the time audible sizzling begins. The pile is cut away thirty seconds after the current has been turned *off* and the clamp and protector are then removed.

4. *Ligature.*—(1) The patient is treated like the clamp operation until the pile is brought down; (2) a gutter is cut in the skin with scissors, around the base of the pile; (3) the pile is transfixed with a needle armed with number 3 chromic catgut, tied off in the gutter and removed.

Both these operations cause some sloughing or swelling, but the end results are satisfactory.

5. The *Whitehead operation* is useful only when the entire anus is surrounded by a mass of piles. A circular incision is made at the junction of the skin and mucosa, the pile-bearing area resected, and the mucosa stitched to the skin.

The operation is rarely to be recommended. It is often followed by stricture or incontinence.

After-treatment.—(1) At the end of the operation, insert a rectal suppository of extract of opium gr. 1, iodoform gr. 5; (2) hypodermics of morphin or heroin will be required in most cases, for the first forty-eight hours; (3) swelling is controlled by hot applications; (4) a rectal tube left in the rectum provides for the painless escape of flatus; (5) the patient wears a sterile pad, and the perineum is irrigated with lysol solution (one dram or two pints) four times daily; (6) the bowels are locked for four days and then moved with castor oil oz. 1, followed by an oil enema when a movement is imminent; (7) catheterization is needed for several days, due to retention of urine from reflex pain, and should be done every eight hours.

In patients who have perineal tears, any operation for hemorrhoids should be accompanied by perineorrhaphy, otherwise return of the hemorrhoids is certain.

Rectal bleeding is usually negligible, if proper technic has been followed. If it is excessive, it is best controlled by a rectal tube surrounded by gauze, or by packing the rectum

with gauze for twenty-four to thirty-six hours, the gauze being then very gently and slowly removed.

VI. PROCTITIS (INFLAMMATION OF THE RECTUM)

This is not common.

Causes.—(1) Polyps; (2) colitis; (3) infected syringe nozzle in giving enemas; (4) gonorrhea; (5) dysentery; (6) foreign bodies; (7) infected hemorrhoids.

Symptoms are (1) tenesmus; (2) frequent defecation; (3) discharge of mucus, pus or blood; (4) fever, in acute cases. The rectal mucosa often prolapses and there is always danger of ulceration and stricture.

Diagnosis.—By proctoscopy the red, swollen mucosa, covered with pus or mucus can be seen.

Treatment is (1) removal of the cause; (2) rest in bed; (3) liquid diet; (4) suppositories of opium and belladonna; (5) hot sitz baths; (6) laxatives; (7) irrigation with nitrate of silver solution 1–5000.

VII. INJURIES OF THE RECTUM

Injuries of the rectum, other than those of childbirth, are due to falls on some sharp object, and are treated on general surgical principles. A curious feature is shock out of all proportion to the apparent injury.

VIII. ISCHIORECTAL ABSCESS

Ischiorectal abscess is due to infection from the rectum, and is a result of periproctitis. It tends to point (1) through the skin near the anus; (2) into the rectum between the sphincters (forming a blind internal fistula); (3) occasionally burrowing across the midline into the opposite ischiorectal fossa.

Symptoms.—(1) Intense throbbing pain in the perineum, made worse by sitting, defecation or any other exertion; (2) always constitutional symptoms of sepsis (fever, rapid pulse and leukocytosis).

Diagnosis.—(1) A bulging tumor, to one side of the anus, brawny, indurated and painful to touch; (2) redness of over-

lying skin; (3) on rectal examination, a tender elastic swelling is felt on the corresponding side.

Treatment.—Early free evacuation, with irrigation and drainage. Spontaneous rupture is to be avoided if possible, due to the danger of fistula. The pus is thick, very foul, and contains bubbles of gas. A *chronic* ischiorectal abscess is usually *tubercular*. The swelling is hard and painless, and then becomes softer as it degenerates. Acute infection is possible at any time, and the resultant fistula is stubborn and persistent.

IX. PROLAPSE OF THE RECTUM

Prolapse of the rectum, in the adult, is seen most often in elderly women, especially those with perineal tears, sphincter tears or prolapse of the uterus. It varies in degree from protrusion of the mucosa to complete inversion of the rectum, with all its coats. Protrusion of the mucosa is limited in extent, more than one inch being rarely seen; in true prolapse of the rectum the mass is sometimes very large. At first the protrusion is painless, but as ulceration of the mucosa takes place, it later becomes a very painful affection.

FIG. 152.—Prolapse of the rectum and uterus. (*Author's case, Philadelphia General Hospital.*)

Diagnosis is obvious, the deep red protruding mass admitting of no mistake.

Treatment is either palliative or operative.

Palliative.—(1) Reposition, in the knee-chest posture, after oiling the mass; (2) strapping the buttocks to prevent recurrence, leaving room for defecation; (3) a vulcanite plug, held in

place by a T bandage, in place of the strapping; (4) strychnin to the point of tolerance; (5) mildly astringent enemas, such as tannic acid two drams, water two pints; or zinc sulphate one dram to two pints of water; or alum two drams to one pint of water.

Palliative treatment offers no chance of cure if there co-exists either a complete tear or prolapse of the uterus.

Operative.—1. *Linear Cauterization:* Under general anesthesia, a blunt pointed Paquelin or electric cautery at dull red heat is used to make six or eight linear burns, along the longitudinal axis of the bowel. Only the mucosa, and *never* the muscular coat, should be seared. The inflammatory reaction set up by this often causes sufficient cicatricial contraction to prevent a recurrence.

2. The *Moschowitz operation*, in which, by abdominal section the rectum is suspended, by a series of purse-string sutures of number 1 chromic catgut or fine linen thread, to the back wall of the uterus, the posterior layers of the broad ligaments and the peritoneum covering the sacrum. This operation is most efficient.

3. *Amputation of the prolapsed portion*, with suture of the mucosa to the skin of the anus. This has the objections of occasional stricture and incontinence, and is indicated only in irreducible prolapse.

An absolute essential, in both palliative and operative cases is the prevention of constipation and its consequent straining, as neglect of this precaution always means recurrence.

X. PRURITUS ANI

Pruritus ani is a symptom of many conditions, chief among which are: (1) Hemorrhoids; (2) proctitis; (3) worms; (4) pediculi or other results of lack of cleanliness; (5) chronic leukorrheal discharge; (6) chronic constipation; (7) diabetes; (8) neurosis. The itching is often severe, and in neurotic cases in pregnancy intolerable.

Treatment is the same as given for pruritus vulvæ, in Chapter

IV, except that the cause is usually more easily found and removed.

XI. STRICTURE OF THE RECTUM

Stricture of the rectum may be due to: (1) Congenital; (2) inflammation; (3) cicatrization of wounds or ulcers; (4) carcinoma; (5) syphilis; (6) tuberculosis.

The bowel above the stricture is always greatly dilated.

Symptoms.—(1) Pain; (2) constipation; (3) ribbon-like stools; (4) discharge of mucus, pus or blood; (5) rarely diarrhea due to enteritis from irritation of the retained feces; (6) at times complete obstruction, especially if malignant.

Diagnosis is made with the finger, if the stricture is not more than four inches from the anus; by proctoscope if higher up.

Treatment.—(1) Gradual dilatation with bougies; (2) rapid avulsion with bougies or dilator, never safe unless the stricture can be reached with the finger. The lower two-thirds of the rectum are not covered by peritoneum, the upper one-third is, and the dividing line is approximately at the reach of the forefinger; (3) incision of the stricture posteriorly, with the same limitations as avulsion; (4) excision of the stricture, with end-to-end anastomosis; (5) routinely in malignant and frequently in syphilitic and tubercular ones, inguinal colostomy.

XII. TUMORS OF THE RECTUM

Tumors of the rectum are either benign or malignant.

Benign Tumors

Benign are (1) **polyp,** which is an adenoma with a long pedicle. It is most common in children but is seen at any age. It is usually single, but may be multiple and varies in size from a pea to a large orange.

Symptoms.—(1) Rectal irritation; (2) discharge of mucus, pus or blood; (3) frequently protrusion of the polyp at defecation.

Treatment is removal by ligature or snare.

2. **Papillomata,** usually benign but occasionally malignant; occur as cauliflower masses, with the same symptoms as polyps. They are removed with ligature or snare, and always examined microscopically.

Malignant Tumors

Cancer is usually tubular or cylindrical celled, and begins either as an ulcer, or as a nodule under the mucosa, with secondary ulceration. It frequently extends as a ring all around the rectal canal. The softer the cancer, the more malignant. Metastases occur late, in the liver, lumbar glands and peritoneum. The disease is commonest in middle life, but has been seen even in childhood.

Symptoms are (1) Pain; (2) tenesmus; (3) rectal irritation; (4) difficulty in defecation; (5) passage of mucus, pus or blood; (6) in the late stages ribbon stools, cachexia and more or less complete obstruction, and sometimes rectovaginal fistula. Symptoms are often very slight, or absent, until the growth has reached a considerable size.

Diagnosis is made by digital examination, which feels a soft, fungating, friable mass, bleeding easily; or a hard firm one with ulcerated surface, with everted edges.

Through a speculum, the growth can be seen and in cases of doubt a piece removed for microscopic examination.

Prognosis is bad. Death results in from one to five years, from cachexia, obstruction, exhaustion or hemorrhage.

Treatment is palliative or operative.

Palliative treatment is only for those cases where the growth cannot be removed. (1) Opium for pain; (2) rectal irrigation; (3) colostomy, which diverts the fecal column and retards the progress of the disease; (4) both radium and *x*-ray have proven disappointing in rectal cancer.

Operative treatment consists in the removal of the growth, possible when it has not involved the perirectal connective tissue or the sacrum or uterus, and there are no demonstrable metastases.

The primary mortality of operation is 25 per cent. and of the survivors only about 20 per cent. are well after three years.

Methods of Operative Treatment.—(1) Vaginal route, when there is a small growth in the anterior rectal wall; (2) anal route, when the growth is very low; (3) perineal route, involving splitting of the perineum, when the growth is not more than three inches up; (4) sacral route (Kraske operation) for growths just beyond the reach of the finger; (5) abdominal perineal, in very extensive involvement.

The last three operations are exceedingly difficult and to be attempted by experienced surgeons only.

Sarcoma has the same symptoms as cancer, is much rarer, occurs at an earlier age and requires the same treatment. It occurs as a large fleshy mass, without primary ulceration.

XIII. ULCERS OF THE RECTUM

Ulcers of the rectum are (1) Simple—due to abrasive wounds, foreign bodies, etc.; (2) tubercular; (3) syphilitic; (4) malignant; (5) acute inflammation; (6) dysentery; (7) typhoid.

Symptoms are (1) Rectal irritation; (2) pain; (3) discharge of pus, mucus, or blood; (4) tenesmus; (5) usually constipation, due to habit because of pain on defecation; (6) more rarely diarrhea (dysentery and typhoid).

Diagnosis is best made through a proctoscope.

Treatment.—(1) Hot enemata; (2) local application of nitrate of silver 40 grains to the ounce (8 per cent.) through a proctoscope; (3) iodoform suppositories 5 grains twice daily, especially in tubercular cases (but *not* if nitrate of silver has been used because of the irritating chemical reaction); (4) salvarsan in syphilis; (5) malignant ulcers treated as described under cancer; (6) in very stubborn cases, temporary inguinal colostomy, the artificial anus being closed after the ulcer has healed (three to four months usually); (7) nearly all cases require some arsenic and strychnin tonic.

CHAPTER XX

ELECTRICITY, X-RAY, RADIUM, MESOTHORIUM AND FINSEN LIGHT

ELECTRICITY

Electricity at one time exploited as a cure-all in gynecology, is very useful in its very limited field. Many exaggerated claims were made, which when exploded brought the entire method of treatment into disrepute. This chapter is designed to give an outline of what it and its allied methods of radiation may reasonably be expected to accomplish.

Apparatus needed for gynecologic treatment consists of the following, as a minimum: (1) A source of current, preferably an apparatus which is connected with the street current and by rheostats, stops it down to a usable strength. A battery is unreliable and the constant recharging a nuisance.

2. A large (six by eight inches) abdominal pad electrode, covered by felt or other moisture containing covering. A small pad is not satisfactory as it does not give proper contact and does not allow enough current to pass.

3. Uterine electrodes, built like sounds, and capable of being sterilized by boiling. The best, and also much the most expensive, have platinum tips. Copper and aluminum are good substitutes, but the positive pole of the galvanic current causes rapid wear and disintegration, which is slowest in the platinum and most rapid in the copper tips.

4. Vaginal and rectal electrodes, though the vaginal may be used as rectal ones.

Properties of Galvanic Current.—The *positive pole* (anode) is hemostatic, promotes contraction of the uterus, and hence controls bleeding; acts as a cautery to the endometrium (mild

but often painful), and contracts down the uterine vessels in the mucosa.

The *negative pole* (cathode) causes hyperemia and congestion of the uterus, promotes relaxation of the muscle and vessels, and allays pain.

Properties of Faradic Current.—(1) *Primary faradic*, causes contraction of the uterus and tends to act as a hemostatic.

2 *Secondary faradic current* is used as a sedative and allays pain.

The action of the slow and rapid interruption is essentially the same.

Properties of Sinusoidal Current.—This current flows in waves, from zero to maximum, with change of polarity at each zero. It is sedative and allays pain when used in the uterus; in the bowel it is an efficient treatment of obstinate constipation.

In gynecologic treatments the *active electrode* is always the *internal* one—in the uterus vagina or rectum. The *abdominal pad* is the *passive* electrode, merely allowing the current to flow through.

Indications for Intra-uterine Electrical Treatment. I. *Galvanic Current.*—1. *Positive pole to uterine sound* in (1) menorrhagia; (2) metrorrhagia (non-malignant); (3) interstitial fibroids (the current will have effect on the bleeding, but not on the size of the growth); (4) subinvolution of the uterus; (5) chronic gonorrheal endocervicitis (copper electrode).

2. *Negative Pole to Uterine Sound.*—(1) Infantile uterus; (2) amenorrhea from causes other than pregnancy or the artificial and natural menopause; (3) superinvolution; (4) lactation atrophy; (4) cervical stenosis with dysmenorrhea; (5) chronic endocervicitis (nongonorrheal).

II. *Faradic current* is used in (1) subinvolution of the uterus; (2) amenorrhea; (3) to control muscles when weakened by long disuse such as relaxed sphincter ani or sphincter vesical.

III. *Sinusoidal current* is used chiefly in the treatment of chronic constipation. It excites peristalsis and is most effective when the lower bowel is filled with water before the rectal electrode is inserted. In the uterus, its uses are the same as the faradic.

Contra-indication to intra-uterine electrical treatment is pelvic inflammation, unless acute symptoms have long subsided. Intra-uterine use of the electric current cannot be said to be entirely safe. With proper aseptic precautions, infection is unlikely, but severe pelvic inflammatory reaction sometimes follows its use, even though all precautions have been taken. When employed, it should be with appreciation of this possibility.

Technic of Application.—1 The patient is arranged in the dorsal position, and the cervix exposed through a bivalve speculum.

2. The abdominal pad is well soaked and applied so that there is firm broad contact to the skin.

3. The apparatus is examined to see that it is in working order, and that no current is turned on until all the electrodes are properly adjusted.

4. The uterine electrode is sterilized by boiling, or if the construction of its insulation does not permit of this, soaked in a solution of 1–20 carbolic acid for half an hour. It is absolutely essential that the electrode be properly sterilized. Neglect on this score may mean severe pelvic infection. Great care must also be taken not to abrade the surface mucosa, in the insertion of the electrode.

5. When ready, the current is turned on very slowly. If the patient complains of burning of the abdominal skin, the contact is poor and the pad too dry. Redness of the abdominal skin is due to too small a pad, but blistering is very rare.

6. At first a current of ten milliamperes is used, and is gradually increased as the patient can stand it. Much lower amperage is used with the positive than with the negative pole.

7. For *uterine bleeding* a galvanic current of 10–50 milli-

amperes is used for fifteen minutes twice weekly, *positive* pole to uterine sound. For *amenorrhea*, scanty menses, infantile uterus, or stimulation of the sphincter muscles, a galvanic current of 20–70 milliamperes for twenty minutes three times weekly, *negative* pole to uterine sound. For *cervical stenosis*, use galvanic current, negative pole to uterine sound, current 10–15 milliamperes for ten minutes, twice at a three-day interval, during the week preceding the menses. For *dysmenorrhea*, use secondary faradic current, for twenty minutes at a time, every other day for the ten days preceding the period.

8. In all cases where the intra-uterine electrode is to be used, pregnancy must be excluded.

9. The length of treatment should not, except for special indications, exceed twenty minutes, to avoid fatigue.

10. The current is turned on very slowly, so as to be barely perceptible, and gradually increased as the patient becomes accustomed to it.

11. The intra-uterine electrode must be constantly watched, as it has a tendency to slip out very easily.

12. The intra-uterine electrode should be sterilized directly after use, and resterilized before being used again.

Cautery.—The electric cautery knife is very useful for excision of small growths, such as: (1) condylomata; (2) small cervical cysts; (3) small cervical polyps; (4) urethral caruncle; (5) persistent erosion of the cervix; (6) abscess of Skene's glands. For growths the knife is used; for erosion the dome-shaped spiral; for inflammation of Skene's glands the needle. A local anesthetic is best employed; 20 per cent. cocain applied to the surface, or 2 per cent. cocain injected into the base of the growth to be removed. The ethyl chlorid spray should never be used, as a preliminary to the cautery, as it is very inflammable.

Fulguration (desiccation) is the process by which small growths or areas are cauterized by a spark of enormous voltage and very low amperage. It is most useful in removing surface blemishes, small warts or pedunculated growths; for cauteriza-

tion of recurrent surface carcinoma, particularly of the mouth or breast or in the scar of the vaginal vault; it is the best of all methods for small papilloma of the bladder, used through the catheter channel of the cystoscope.

High frequency, in gynecological work, is used chiefly in control of pelvic and sciatic pain, to reduce high blood-pressure, and particularly in pain caused by pelvic exudate persisting after pelvic peritonitis.

The current has an enormous voltage but very low amperage.

The main electrode is a pad on which the patient sits; the other electrode is held in the hands.

X-RAY

The uses of the *x*-ray in gynecology are two-fold; (1) for *diagnostic* purposes; (2) for *therapeutic* purposes. The rays are capable of great damage, in inexpert hands, the greatest danger being that of *burns*, which are very slow to heal, resist all applications, are very painful and at times very deep and dangerous. They are most common in cases requiring prolonged treatment, as for cancer and fibroid; syphilitic patients are much more likely to be burned, hence a Wassermann test should always be made as a preliminary to *x*-ray treatments, and if positive, the treatment should be avoided or at least the time of exposure materially shortened.

Diagnostic use of the x-ray is chiefly for the following: (1) Gastro-intestinal tract, after a bismuth meal; (2) pyelography for the pelvis of the kidney and ureter, after they have been filled with collargol or 10 per cent. thorium nitrate solution; (3) the diagnosis of pregnancy, after the sixth month of gestation. Prior to this the fetal skeleton casts no appreciable shadow, and often even at term the shadow is exceedingly faint and thin; (4) diagnosis of osseous deformity of the pelvis; (5) diagnosis of pelvic tumors; usually unsatisfactory, because they rarely cast sufficient shadow; (6) diagnosis of foreign bodies left in the abdomen at a previous operation. (7) Diagnosis of kidney and ureteral stones.

Uses of X-ray in Treatment.—(1) Bleeding from fibroid tumors; (2) metrorrhagia from myopathic uteri or other causes; (3) cancer of the uterus; of very doubtful value; (4) superficial cancers of the vulva or breast; (5) lupus vulvæ; (6) kraurosis vulvæ; (7) pruritus vulvæ, (8) excessive sexual hyperesthesia (nymphomania); (9) for the production of artificial sterility, by causing loss of ovarian function.

Disadvantages and Dangers.—(1) In fibroid tumors, the bleeding may be controlled, and the artificial menopause produced, but it has no effect on subsequent degeneration of the growth. If malignant degeneration has begun, the effect of the ray is often to stimulate the process to furious activity. (2) *Burns* are always a painful and distressing complication and often very dangerous one; the more anemic the patient, the more likely she is to be burned; (3) the artificial menopause induced by the rays is often complicated by very severe nervous symptoms, much more severe than the surgical menopause; (4) in patients in the childbearing period, the possibility of causing permanent amenorrhea and sterility, even with short exposures, must be borne in mind; (5) in deep-seated cancer, the rays often relieve pain, but do not influence the process in other ways; (6) many patients complain of severe digestive disturbances, of long duration.

Treatment by *x*-ray is a process involving considerable outlay in time, money and patience. It is a two-edged sword, capable of benefit in one direction often at the expense of harm in another, and is not a method adapted to amateur experimentation, but one to be used only by those thoroughly familiar with the apparatus they handle.

RADIUM

The physical properties are thus described by Burnam: "Radium is a metallic element belonging to the strontium-barium group. It readily forms salts with the mineral acids and is the leading member of the peculiar radio-active group of elements which are characterized by atomic instability.

"Radium itself is formed by atomic reduction from uranium. It loses a portion of its atom to become a gas called radium emanation, and this, in turn, is the mother, grandmother, etc., of a series of solid elements. The so-called radium C, third in series from the emanation, is that member of the group which particularly concerns us, as it is from it that both the beta- and gamma-rays are derived. Radium emanation can be separated from radium as fast as it is formed. A given amount of radium is capable of producing a given amount of emanation. The emanation reaches a maximum and then disintegrates at the same rate that it is being formed. In about four days a given amount is reduced to one-half. If radium or radium emanation is sealed in a glass or metal container it begins to produce radium C. The maximum amount of radium C is obtained in a radium preparation so placed in a glass tube in thirty days. The maximum amount from emanation is produced in three hours and thirty minutes. Radium C itself can be isolated, but has such a short life, only two or three hours total, that it cannot be used effectually in practical treatment.

"The essential characteristic of the radio-active substances is the giving off of invisible rays. These rays must not be confused with the emanation, which is an element just as radium itself is. The rays have been divided according to their physical characteristics into three kinds: the alpha, the beta, and the gamma.

"The alpha-ray is a positively charged atom of helium. It has a very small power of penetration, being completely stopped by a thin sheet of writing paper. It acts very powerfully toward inducing chemical change in both inorganic and organic matter brought in contact with it. The beta-ray is a negatively electric ion which has about the velocity of light and will easily penetrate several centimeters of living tissue. It has also a marked capacity for inducing chemical changes in organic matter subjected to it. The gamma-ray is not particulate matter, but a vibration of ether similar to ordinary

light and of *x*-ray. It differs from them in being of much shorter wave length and of much greater penetration. It has power also, but to a lesser degree than the alpha- and beta-rays, to produce chemical change in organic matter exposed to it. When radium is enclosed in a glass tube, alpha-, beta-, and gamma-rays are produced within the container. The alpha-rays are held in the tube, while the beta- and gamma-rays penetrate its walls, and pass out into the surrounding medium in radial lines, thus making a sphere of radiation. When the glass tube is further surrounded by 2 mm. of lead, the hardest beta-rays can no longer penetrate this envelope. It is possible, therefore, in medical treatments to use all three kinds of rays together, the beta- and gamma-rays together, or the gamma-rays alone. It is impossible to use the alpha-rays alone, and it is difficult to use the beta-rays alone in anything except experimental work.

"From the above it is evident that radium or one of its derivatives can be used in two essentially different ways: first, it can be taken into the body by mouth, hypodermically or intravenously as any other soluble drug; second, it can be applied from either outside or inside the body in sealed tubes or other containers in the same general way that an *x*-ray tube is employed."

As the alpha- and beta-rays are the ones that burn or act as unfavorable stimulants, they are filtered out by encapsulating the radium in a cylinder of some metal, like lead, silver, brass, platinum or aluminum. Of these brass seems to cause the smallest loss of the desirable gamma-rays, and hence is to be preferred, though the choice is not a matter of much moment, as the difference is small.

Method of Use.—A minimum amount of 50–100 mg. of radium, in a glass tube, is enclosed in a brass filter and then in a finger-cot, and is inserted in the uterine canal and held in place by a temporary suture through the cervix, which grips the end of the finger-cot as well. It is left in place from three hours to five days, according to the judgment of the operator,

eighteen hours being the average. About two weeks is allowed between treatments. The gamma-rays penetrate and kill cancer cells to a depth of 3–4 cm., and beyond this point have an inhibiting action on their growth.

The gamma-rays and the hard beta-rays have a selective action on cancer cells, killing them without damage to the normal cells surrounding the area of malignancy.

Effect of radium depends upon: (1) The age of the growth; (2) the amount of radium used; (3) the amount of filtration; (4) the length of exposure; (5) the distance or depth of the growth; (6) the length of exposure and (7) the frequency of treatment.

Favorable Effects.—(1) In metrorrhagia from a myopathic uterus, 100 per cent. of cures can be expected; (2) in cancer of the cervix the fetid discharge and bleeding cease; (3) the growth diminishes in size or even disappears; (4) pain is promptly relieved; (5) inoperable cases may be made operable; (6) the most favorable results are obtained in recurrence in the vaginal scar after hysterectomy; because the younger the cancer cell, the more destructive to it is radium.

Dangers and Disadvantages.—(1) Overdosage, or too long exposure may result in excessive destruction of tissue; (2) under dosage or too short exposure, may stimulate the malignant growth to activity; (3) if pelvic infection is present, active pelvic peritonitis may result; (4) if cancer has involved the bladder or rectal wall, fistulæ are very likely to result; (5) hysterectomy too soon after radium treatment is very likely to be followed by fatal postoperative sepsis; three weeks at least should elapse; (6) after treatment prior to hysterectomy, the parametrium is sclerosed and infiltrated, and this adds materially to the difficulty of the operation.

Reaction from use of radium is small as a rule, but may be evident as: (1) Headache; (2) abdominal pain; (3) pain in bladder; (4) diarrhea; (5) fever or moderate degree (101–102); (6) occasionally acute nephritis.

These reactions are most common in elderly patients and in those with severe anemia.

The expense of a quantity of radium sufficient to carry out treatment is so great that it must necessarily remain a method for large institutions rather than the individual physician.

MESOTHORIUM

Mesothorium is like radium in its physical properties and effects, and what has been said about radium applies to mesothorium as well. While radium continues giving out its emanations in undiminished volume for many centuries, mesothorium is exhausted and inert in about twelve years.

FINSEN LIGHT

Finsen light therapy is of use only in lupus vulvæ, and does not even there give results comparable to the *x*-ray, hence its use in gynecology is practically nil.

CHAPTER XXI

ENDOCRIN GLANDS AND THEIR EXTRACTS IN GYNECOLOGY

The beginning of organotherapy was Brown-Séquard's experiments, in 1889, with injections of testicular juice. Since then a mass of literature and experimental work has been accumulating, though the surface has hardly as yet been scratched. For much of the material from which this chapter is compiled, the author is indebted to the articles by Hugo Ehrenfest in Crossen's Gynecology and W. P. Graves.

The term ductless gland (endocrin) is applied to a number of special glands or organs, producing biologic substances which when absorbed into the blood in normal amounts, maintain the organism at par, and exert definite effects on distant organs. They are: (1) Thyroid; (2) parathyroid; (3) thymus; (4) suprarenal; (5) pituitary gland or hypophysis cerebri; (6) pineal gland or epiphysis cerebri; these the true ductless glands; (7) pancreas; (8) ovary; (9) testicle; (10) mammary gland; these having external as well as internal secretory function; (11) the corpus luteum; (12) the placenta; from which animal extracts for therapeutic purposes are made and hence deserve inclusion in the list.

The sex glands (testicle and ovary) are largely responsible for the development of male and female characteristics in the individual and their early removal exerts a profound influence on the development of these characteristics.

Increased activity of a gland is *hyperfunction;* diminished activity is *hypofunction.*

The active materials of the endocrin glands are of a simpler chemical constitution than enzymes, and are not rendered

inert even by prolonged boiling, and are known by the generic term of "hormones."

Interglandular Relations.—While it is known that the action of most of the ductless glands is correlated and often reciprocal, exact knowledge is wanting. Hypofunction in one gland is supposed to induce hyperfunction in another (as in the ovary and thyroid), if under normal conditions they are antagonistic. Perfect harmony and balance between all the endocrin glands results in normal development; abnormal development is often a result of disturbed balance. Our present knowledge is too meager to formulate definite statements as to the mechanism.

In experimental work, hormones act differently on different species of animals; deductions drawn from animal experimentation and applied to the human being are often absolutely incorrect. Of all the active principles, as yet only *adrenalin* has been isolated in pure form.

1. **The Thyroid.**—At puberty the thyroid often takes on considerable enlargement, which is much more marked in girls than in boys. The nervous disturbances of puberty are ascribed to hypersecretion of the thyroid. The thyroid and ovary are antagonistic, and women with diseased thyroids usually have menstrual disorders; also patients in whom a goiter has been too completely removed often develop menorrhagia, which yields to the administration of thyroid extract.

The thyroid frequently swells in pregnancy, and while the enlargement is usually moderate, it is sometimes very great. It disappears, as a rule, during the period of lactation. Exophthalmic goiter is eight times as common in women as in men. It is frequently a complication of pregnancy, which influences the goiter unfavorably. When associated with pelvic conditions requiring operation, it adds appreciably to the risk. Cretinism (myxedema) is due to absence or early atrophy of the thyroid, and the adult type is much more frequent in women than in men; in these cases infantile genitalia and sterility are the rule.

2. **Parathyroids.**—When the parathyroids are removed, in animals, death follows from acute tetany; this tetany can be controlled by administration of parathyroid extract. Based upon this, the extract has been recommended in eclampsia in the human being, but clinically the results have been nil.

3. **The Thymus.**—The thymus, until puberty, has an unquestionable relation to the development of the sexual organs. At puberty there is a marked involution in the gland. If the genitals are infantile, involution takes place later than normal. No definite results, of value from a therapeutic standpoint, have yet been attained in experimental work.

4. **Suprarenals** (Adrenals).—Animals with marked sexual powers are possessed of markedly developed adrenals also. Negroes show this more markedly than the white race. In individuals with hypoplastic genitalia, a diminution of the adrenals has been noted. Hypernephroma in children also produces precocious sexual development. Castration is followed by development of the adrenals, possibly as a compensatory process for the loss of ovarian secretion.

Individuals with Addison's disease frequently have hypoplastic genitalia, amenorrhea, and are sterile. If they become pregnant, the pregnancy has a deleterious effect upon the disease and abortion is common.

Adrenalin is the only active principle of any of the ductless glands which has so far been isolated in pure form.

5. **Pituitary** (Hypophysis Cerebri).—This gland has a marked relation to the sexual organs. During pregnancy it is hypertrophied, and to this is ascribed the acromegalic changes often seen in the faces of pregnant women. The hypertrophy is confined to the anterior lobe, and does not return to normal for several years after gestation.

Removal of the anterior lobe causes in animals marked obesity, the genitalia of adult animals atrophy while those of young ones do not develop. The genital changes were much more marked in young than in adult animals. If the gland was removed in pregnant animals, they invariably aborted. If

hyperfunction of the pituitary occurs *before* puberty, gigantism results; *after* puberty, acromegaly.

Hypofunction *before* puberty results in dwarfism; *after* puberty, in obesity associated with genital atrophy (dystrophia adiposogenitalis).

Organotherapy.—Preparations of the pituitary are: (1) Extracts of the whole gland, in powder or tablet form; (2) extract of the anterior lobe in tablet or as a liquid extract in ampules; (3) extract of the posterior lobe in tablet or as a liquid extract in ampules.

Extract of the whole gland is used in obesity with genital atrophy, as is also extract of the anterior lobe. The anterior lobe limits carbohydrate absorption. It has been used, but with poor success, as a galactagogue.

Extract of the posterior lobe is a very active and powerful stimulant to unstriped muscle, hence stimulates uterine contraction in labor. It is of great value in controlling distention after abdominal section, and to stimulate the bladder in postoperative retention of urine. It raises blood-pressure, and hence combats postoperative shock. It controls bleeding in cases of uterine inertia and particularly in menorrhagia of youth. It is an active heart stimulant.

6. **Pineal Gland** (Epiphysis Cerebri).—Hypofunction of this gland in early childhood, produces marked sexual precocity; its hyperfunction causes marked obesity.

7. **Pancreas.**—No definite relation between the pancreas and genitalia has yet been established.

True diabetes, induced in animals after conception, causes abortion. In human beings, pregnancy influences diabetes unfavorably, except under careful and rigid dietary control, and abortion is exceedingly common.

8. **Ovary.**—The ovary is a true organ of internal secretion as is proven by results from transplantation of ovarian tissue. Castration before puberty causes failure of genital development, while after puberty it causes atrophy similar to the menopause. Injection of ovarian substance relieves the

unpleasant symptoms of this condition, and if injected in virgin animals creates hyperemia of the internal and external genitalia.

From what part of the ovary this secretion is manufactured is not known. But there is evidence to support the following conclusions: (1) The follicle apparatus controls the growth and nutrition of the genitalia. (2) The corpus luteum controls menstruation, and prepares and sensitizes the endometrium for the reception of the impregnated ovum. The destruction of the corpus luteum in animals results in abortion. (3) The part played by the interstitial gland is a matter of conjecture, but it is supposed that it shares with the follicle apparatus some power of control over development of the genitalia.

Hypofunction of the ovary causes: (1) Lack of development; (2) because of the associated development of the anterior lobe of the hypophysis, adiposis and genital atrophy; (3) infantilism; (4) atrophy of the uterus and external genitalia; (5) fuctional amenorrhea; (6) after castration, and at normal menopause, hot flashes, dizziness, sweats and other vasomotor disturbances.

Hyperfuncton of the ovary is not as well understood. It is supposed to cause menorrhagia; premature sexual development; overfertility; delay in coagulation time of the menstrual blood.

All these are based upon theoretical grounds and are not well founded on scientific proven facts.

Organotherapy.—Ovarian extract is prepared as: (1) Powder or tablets of ovarian substance; (2) powder or tablets of corpus luteum; (3) hypodermic extract of corpus luteum; (4) hypodermic extract of whole ovarian substance; (5) hypodermic extract of ovarian substance with the corpus luteum removed (called ovarian residue).

These preparations are from the pig, cow, or sheep. It is claimed that the corpus luteum of the pig approximates most closely, in the character and number of its lutein cells, that of the human being. Extracts of human corpus luteum, prepared from material secured during operations are

more active than those of the lower animals, but the supply is too limited and uncertain ever to make the human extract of practical value.

Because the corpus luteum in pregnancy is supposed to be more stable, ovarian extracts are best made from ovaries of pregnant animals.

Uses.—(1) Functional deficiency or absence of ovarian internal secretion, seen at the surgical or natural menopause. (2) Young women with fuctional amenorrhea or scanty menstruation. (3) Cases of pruritus, kraurosis or other vulvar affections in elderly women, dependent upon inadequate circulation. (4) Repeated abortions without demonstrable cause, but due presumably to the absorption or blighting of the corpus luteum. (5) The control of the nausea of pregnancy.

The use of ovarian extracts is not dangerous. The only toxic effect of mouth administration is nausea. Hypodermic extracts cause, rarely, urticaria and, still more rarely, mild anaphylaxis, shown usually by depression of blood-pressure and headache. This is more common in corpus luteum extracts than in those of the whole ovary.

The dosage of the powder or tablets is five grains four times daily; one grain representing six or seven grains of the fresh substance.

For hypodermic use, the dose is one ampule (1 mil representing 20 mg. of the fresh substance) daily in series of twenty-four doses, with an interval of six to eight weeks between series, as the effect is often cumulative.

9. **The mammary gland** has a definite, but little understood relation to the genitalia. At puberty the breasts develop; at each menstrual period, they enlarge in many cases; in pregnancy they undergo marked hypertrophy and after the menopause they atrophy.

Hypoplasia of the breasts following castration can often be prevented by ovarian transplantation.

The nature of the hormone controlling the development and function of the breast is not known.

Extract of mammary gland is used in the control of functional menorrhagia or metrorrhagia, due to adnexal disease, fibroid tumors and metrorrhagia myopathica, but the results have not been brilliant, and the practical use is small.

10. **The placenta** is not an organ of internal secretion, but its extracts have certain influence of the maternal organism. The substance extracted from the placenta appears to be identical with a similar substance from corpus luteum. In animals, placental extract induces hyperplasia of the uterus and breasts and acts as a galactogogue.

In human beings extracts of the placenta of lower animals do not have routinely a similar effect, though such might and probably would be the case were the material of human origin. It was, in the middle ages, a common practice for midwives and physicians to feed finely chopped placenta to recently delivered women, as a galactogogue.

Gynecological anomalies due to disturbed function of the endocrin glands are: (1) Failure of development of the genitalia; (2) infantilism (imperfect development); (3) delayed puberty; (4) precocious puberty; (5) menstrual abnormalities (oligomenorrhea and menorrhagia); (6) uterine atrophy; (7) metrorrhagia; (8) obesity with genital hypoplasia and sterility.

Methods of Administration.—Mouth administration of extracts in powder or tablet form has been, till lately, the method employed. The average dose is 5 grains four times daily. The method has certain disadvantages; (1) Gastric disturbance (nausea) necessitating discontinuance of the drug; (2) the substance does not keep well and oxidizes easily on exposure to the air; (3) most important of all, the substance does not enter directly into the circulation, but is changed and in many cases destroyed by digestion.

Hypodermic **intramuscular** administration is deservedly increasing in popularity and is much the better form of administration. The average dose is one ampule daily. The best syringe is glass, boiled and cooled before the substance is drawn into it. Alcohol is not a good sterilizing medium and

inhibits the activity of the extract. *Injections are given deep intramuscularly and never subcutaneously.* Abscess, with proper technic, need not be feared, but local hyperemia is the rule for a few hours. If the site of injection is painful, a dressing of alcohol and water, equal parts, promptly relieves the discomfort. The site of injection should be massaged for a minute after the injection.

Reaction after hypodermic administration is uncommon. Urticaria sometimes occurs in sensitive individuals as in any animal serum. Anaphylaxis is very rare, and mild when it does occur, and is shown by headache and lowered blood pressure.

Pluriglandular therapy, or administration of extracts of several glands (thyroid, pituitary and ovary) is useful in all cases where ovarian extract or corpus luteum is indicated, except castration. It is most useful in functional amenorrhea or oligomenorrhea, and especially in cases with marked neurosis or neurasthenia and obesity. In disturbances of the menopause, to be effective, it must be given with corpus luteum extract, but is no more effective in these cases than the corpus luteum extract alone.

CHAPTER XXII

GENERAL TECHNIC OF GYNECOLOGIC SURGERY

The author has attempted to described in this chapter a technic that has given him good results, and has emphasized certain points of importance which the student is liable to overlook. The chapter is designed to furnish the student a groundwork from which to develop a technic of his own.

The equipment of a hospital operating room is designedly omitted. Hospitals are so well standardized that such a description is unnecessary in a book of this character.

I. **Preparation of Patient for Abdominal Section.**—*Day before Operation.*—Urine examination, blood count and full bath. 4 P.M. Scrub abdomen and upper one-third of thighs for ten minutes by the clock, using soft bristle brush (face brush) or gauze; after first two minutes shave *completely*. Rinse off soapsuds, and scrub for one minute in alcohol (95 per cent.) using fresh brush, rinse off again with sterile water, dry with sterile towel, and apply dry sterile gauze dressing with binder, covering abdomen and upper one-third of thighs, and fastened down by spica bandage so that it cannot ride up and expose the abdominal skin.

7 P.M. She is given a light supper.

9 P.M. Give one ounce of magnesium sulphate, or, if this is objectionable to her, eight ounces of flat magnesium citrate (without the gas).

If she is nervous or sleepless, ten grains of veronal or trional are given.

Day of Operation.—Early in morning, cup of beef tea, no other breakfast. Two hours before operation repeat scrubbing of day before, except that shaving is omitted, and after alcohol,

apply dressing moist with 1 per cent. formalin solution, held in place by same kind of binder. An hour and a half before operation cleanse lower bowel by simple enemas so that last enema returns clear.

Three-quarters of an hour before operation give hypodermic of morphin sulphate gr. $\frac{1}{6}$, atropin sulphate gr. $\frac{1}{150}$. Catheterize just before etherization, and *never* trust to voiding.

The nurse who does the scrubbing must prepare her hands and wear sterile gown and sterile gloves, as for an operation. No preparation on the table except wiping the abdomen with 70 per cent. alcohol, to take care of the surface infection due to perspiring under the dressing.

In all abdominal sections, the abdomen is covered with rubber dam, through which the incision is made. Before the peritoneum is opened, the edges of the rubber dam are sewed into the wound, so that the skin is completely covered. In a wound of ordinary length, one stitch to each side is sufficient. The principle involved is the same that demands the wearing of rubber gloves; as the human skin cannot be sterilized, it should be covered as much as possible.

In emergency cases, where time is limited, or where the abdomen is very sensitive, cover abdomen, *after* shaving, with gauze *dripping wet* with tincture of green soap, and cover with binder; after two hours, take off gauze, wipe off abdomen with alcohol 95 per cent., and apply wet dressing of 1 per cent. formalin for two hours, held on by binder.

II. **Preparation for any Vaginal Operation.** *Day before Operation.*—4 P.M. Shave pubes completely. 9 P.M. Magnesium sulphate $\frac{1}{2}$ ounce.

Day of Operation.—Early in morning, cup of beef tea, no other breakfast. Clear lower bowel out thoroughly by repeated enemas, so that last enema is given at least two hours before operation. Continue enemas until the water returns clear. Two hours before operation give paregoric one and one-half teaspoonfuls. Catheterize just before etherization.

Do not give any hypodermic of morphin and atropin. The

paregoric takes its place. Paregoric inhibits peristalsis much better than morphin, and makes less likely the annoying accident of a bowel movement during the operation. Should the patient have much mucus in the throat during anesthesia, atropin may be given hypodermically, without morphin.

Local preparation is done on the table, and consists of careful scrubbing of the external genitalia with tincture of green soap and hot water, using cotton pledgets, and *not* gauze. Then the vagina is cleansed with the same solution followed by a douche of lysol (1 dram to 2 pints) solution, and followed in turn by 70 per cent. alcohol. In cases with intact hymen, the internal scrubbing is of course omitted and the douche alone used.

III. **Preparations for Operations in Private Houses.**—It is perfectly feasible to arrange private houses for operations so that the lack of hospital facilities need not seriously be felt. An abdominal operation is, of course, more easily done and the patient more easily cared for in a hospital than at the patient's home, but even this type of operation can adequately be cared for at home, provided the preparation is sufficiently well made. Ordinary operations, especially plastics for the repair of the injuries of childbirth, are satisfactorily done in the patient's home. A trained nurse, or one at least accustomed to the care of surgical cases and with a working knowledge of asepsis, is most desirable, but not indispensable, provided the physician is willing to give minute instructions as to the care required and to attend to such details as catheterization himself.

The Choice of a Room.—If possible, the room should be one adjoining the patient's bedroom, and preferably not the patient's own room. The patient is thus spared the sight of the necessary preparation. The paramount question is one of light, and the operating table should be so placed as to get the maximum amount, hence, near the window. The window can be screened against outside observation by covering it with a single piece of gauze or by pinning together the curtains, provided they are of a material which will transmit the light

without too much diminution, or even by soaping or whitewashing the panes of glass. Except for an abdominal operation it is not necessary to strip the room or take up the carpets or rugs. The floor can be protected by newspapers, thickly laid, and over these a sheet, wrung out of a 1–1000 bichlorid solution, should be spread and should be damp when the operation is begun. Any unnecessary hangings ought to be removed and the furniture moved to a part of the room where it will be out of the way and covered with sheets. The walls in the immediate vicinity of the operating table should be

FIG. 153.—A room in a private home arranged for operation. In the center is the kitchen table with a Kelly pad made of newspapers, and covered with a sheet. To the right is a table carrying a pile of sterile towels, a jar of pledgets, a bottle of sutures, and the instrument pan. On the left is a sewing-table with one bowl of 1 per cent. lysol, one bowl of 1:1000 bichlorid, each with pledgets, a pitcher of fresh hot lysol solution, and a saucer containing alcohol for the knives. (*De Lee.*)

protected by sheets held up by the glass-headed pins known as Moore's push-pins, and not by tacks. The pins leave no scars, as tacks do, especially in wall-paper and plaster.

The Operating Table.—This should preferably be one of the models of portable, collapsible operating tables, but this is by no means a necessity. A kitchen table with sufficient strength of legs answers every purpose. If this is used, the top must be thoroughly scrubbed and then *thickly* padded, as the thinly padded table is a prolific cause of backache after operations. In many operations, notably perineal operations,

a pad can be improvised by rolling up rubber sheeting at the sides and back, or even newspapers covered by towels or sheets. A Kelly pad is not a desirable feature. It is too easily infected and too hard to clean. The special tables are provided with stirrups and leg-holders for the lithotomy position, when this position is desired. The kitchen table can be equally well equipped with either Edebohls' portable leg supports, which clamp on the edge of the table, or, much better,

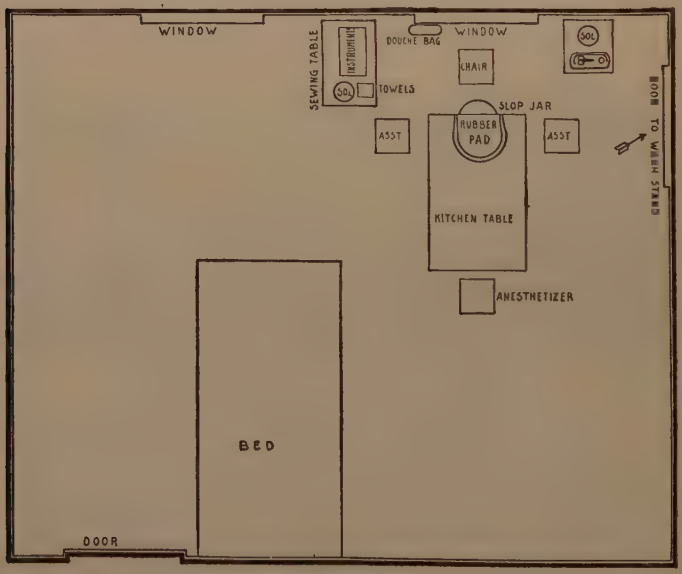

FIG. 154.—Diagram of room in private house arranged for operation.

by a rolled sheet tied about one knee, passed back over one shoulder and out under the other (so that pressure does not come altogether on the patient's neck) and fastened above the other knee. The knots should be on the outside of the leg. This makes the best leg-holder I know. If the Edebohls' supports are used, it will be found necessary to tighten the screws with a wrench (no one's fingers are strong enough), for, if the patient should strain, the leverage is enormous.

If a chair or stool is needed, a piano-stool draped with a sheet is most satisfactory, but a plain chair (not too low) will answer. The end of the Kelly pad, or its substitute, should drain into a bucket or slop-jar which has been well scalded out.

The special operating tables have apparatus for the Trendelenburg position; the kitchen table can be equally well equipped

FIG. 155.—Lithotomy position with limbs supported by a sheet-sling. (*De Lee.*)

by raising the two legs on blocks or bricks, or even, if the extreme position is desired, on the seats of two chairs. The whole table is best draped in a sheet, although this is not essential.

Instrument and Dressing Tables.—Two of these are required, one on either side of the operating table. As these tables often have polished tops, adequate protection must be provided. This is best done by covering the top thickly with newspapers, placing on these a large tin tray and covering all

with a sheet, draped so that it will touch the floor on all sides. This to protect the legs and sides.

Douche Bag.—This is needed in all perineal operations, and a more efficient means of splashing the wall paper than an improperly hung douche bag can hardly be devised. A suitable hook is provided, preferably in the window frame. An open towel is placed over this hook so that the center of the towel is over the hook. The bag is hung on the hook and the towel allowed to drape over it. This has proved an adequate protection. The douche bag and tube are, of course, prepared by boiling.

Instruments.—It is best to boil these where the physician and nurse can keep an eye on them. A large alcohol lamp and a copper tray sterilizer or basin will be satisfactory. If an alcohol lamp is placed in the bath-tub, and the instruments are sterilized there, it will guard against the danger of upsetting them and possibly a conflagration. If the instruments are sterilized over the kitchen stove, servants must be warned not to touch them.

Dressings.—For all ordinary operations the commercially sterilized gauze and cotton are entirely satisfactory. For abdominal operations the dressings should preferably be steam sterilized either in an autoclave or even in a Rochester steam sterilizer. If the latter is used, the final sterilization should be completed just before the operation. It is not possible adequately to dry dressings so sterilized, and it is better to have them warm and wet than cold and clammy. Sheets and towels can be adequately prepared by freshly laundering them and then ironing with an iron hot enough to come just short of scorching them. The time-honored custom of baking in the oven of the kitchen range is useless. Such dressings are not sterile unless so scorched as to be unfit for use. For gauze sponges, I have always found the commercially sterilized gauze safe. If sea sponges are used, they must be soaked over night in a 1–500 bichlorid or a 1–20 phenol (carbolic acid) solution. Boiling them destroys their absorptive qualities.

Basins.—Unless the physician carries his own nest of basins, he must depend on the household supply. Three at least are needed and they must be boiled. Rinsing or wiping them out with an antiseptic solution is not sufficient.

Scrubbing.—The best arrangement for scrubbing up and sterilizing the hands can be made in the bath-room. Running water and previously boiled nail-brushes are used, and to obviate stooping over, the dishes of soap, alcohol, etc., can be arranged on a bread board placed over one end of the tub and resting on the sides of the tub.

Rubber Gloves.—Steam sterilized and, hence, dry gloves are best, but this is not always practicable. Boiling is a method

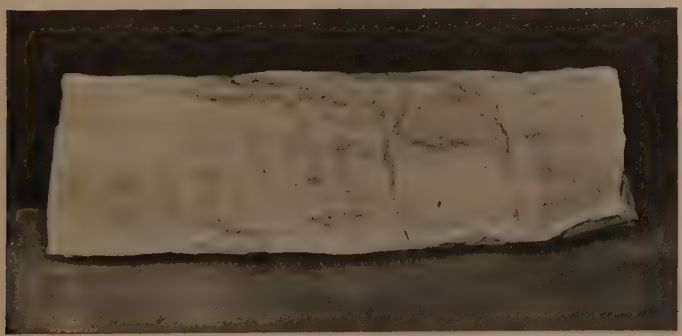

FIG. 156.—Rubber gloves, wrapped *flat* in a towel or gauze and properly prepared for boiling.

always available and satisfactory. The gloves must be boiled wrapped in gauze or a towel, and should always be boiled flat so that the water can enter them. The custom of boiling gloves rolled up in a ball is a pernicious one, as the inside of these gloves is never sterile and most of the outside is open to grave suspicion.

Sterile Water.—The night before operation a clothes-boiler is filled with water. In it are placed three pitchers and a dipper with a hooked handle. These are boiled for half an hour. The pitchers are hooked out of the water with the handle

of the dipper and filled, and then towels are tied over their tops and they are set aside to cool over night The next morning the clothes-boiler full of water and the dipper are boiled again. Thus by mixing the cold water that has stood over night with the hot water boiled just before the operation a supply ample for most operations is secured.

In emergencies, the bottled distilled water sold at all drug-stores is adequate for the cold sterile water, except in abdominal operations. The water in the pitchers can be

FIG. 157.—Rubber gloves improperly prepared for boiling. They are not sterile as the boiling water cannot come in contact with every part of them.

cooled in a reasonably short time by pouring cold water over the outside of the pitchers.

Supplies Required.—The supplies needed for an ordinary operation are as follows: six sheets; twelve towels; 8 ounces of 95 per cent. alcohol; 8 ounces tincture of green soap; 1 pound of absorbent cotton (two half-pound rolls); one 5-yard roll of sterile gauze; one 1-yard jar of iodoform gauze; one bottle of mercuric chlorid tablets; one 2-ounce bottle of glycerin (as a lubricant for putting on wet gloves); two ¼ pound cans of ether, unopened; three small coarse (not silk)

sponges, size of lemon; one 1-yard package of sterile gauze (for the etherizer, to avoid opening the larger package).

This list is best printed on cards, and one sent to the patient's house to guard against details being forgotten.

Nurse's Kit.—It is useful to provide the nurse who attends to the preparing of houses with a bag equipped with what has been found needful. This bag is small and easily carried, but contains nine basins, twelve brushes, twelve pairs rubber gloves; all the catgut used in the operation (from eight to ten boxes being carried); a rubber sheet; douche bag; razor for shaving patients (especially in perineal operations); gown and uniform; the glass pins (three dozen) used for protective sheets, and a roll of safety pins.

It is perhaps unnecessary to point out that all visible disturbances caused by these preparations should be cleared away, and all soiled linen and sponges and water disposed of as soon as possible. This is particularly desirable when everything has been prepared in the patient's room. No sign should be left for the patient to see on recovery from the anesthetic.

IV. **Choice of Time of Operation.**—For operations of election one week after the menstrual period is best. The unexpected appearance of a period does not as a rule contra-indicate operation, though rarely patients show evidence of shock thirty-six to forty-eight hours after operation if it has been done during a period. It is best to avoid operation at such a time, if possible.

V. **Preparation of the Surgeon, Assistants and Nurses.**—Persons engaged in surgical work should not come in contact with infectious diseases. In all cases sterile operating suits, caps, gowns and gloves should be worn. In abdominal cases, face masks as well are essential. No one concerned with the operation should come in contact with suppurating wounds at any time unless protected by rubber gloves. No one with an infected wound or furuncle on hand or arm, or with acute throat infection should take part in an operation.

The technic of hand disinfection is described in paragraph VIII. For abdominal section, to secure the greatest efficiency, an assistant, a sterile nurse and two general nurses are required. For a plastic operation, one assistant, one sterile nurse and one general nurse. In addition, it adds much to the speed of an operation if an extra nurse can be provided for the sole purpose of threading needles.

VI. **Preparation of dressings, towels, sheets, etc.,** has been described on page 398. Wherever possible, autoclave sterilized material should be used.

Sponges, in surgery, are squares of gauze. Two kinds are required: (1) Large squares, six layers thick, 10 × 12 inches in size, with a piece of tape six inches long securely sewed in one corner; these are used in the abdomen to pack back the intestines, and a forceps is fastened to the tape. (2) Small squares three or four inches square, for mops. All sponges should have their edges sewed to prevent raveling. They are put in packages of a known number, are counted before the operation is begun, and in abdominal operations, must all be accounted for before the peritoneum is closed.

Gowns should be long sleeved, reaching to the wrist, so that the cuff of the glove is turned up over the sleeve and all skin covered.

VII. **Suture material and ligatures** are either permanent or absorbable.

Permanent.—1. *Silk,* either braided or twisted, the former much the stronger, is sterilized either in the autoclave, or by boiling. It should not be used in the pelvis in infected cases, as it tends to cause a sinus which persists until the knot is discharged.

2. *Silver wire* is not much used at present. It is sterilized by boiling with the instruments, tends to cut rather badly and is painful to remove.

3. *Pagenstecher thread,* or linen thread covered with celloidin, is better than silk. It is three times as strong, weight for weight, is non-capillary and can therefore be used in finer sizes.

It is chiefly used for intestinal, uterine suspension and skin stitches, and can with benefit be substituted for silk wherever the latter could be used. It is sterilized like silk, and withstands repeated sterilization better. Barbour's linen thread,

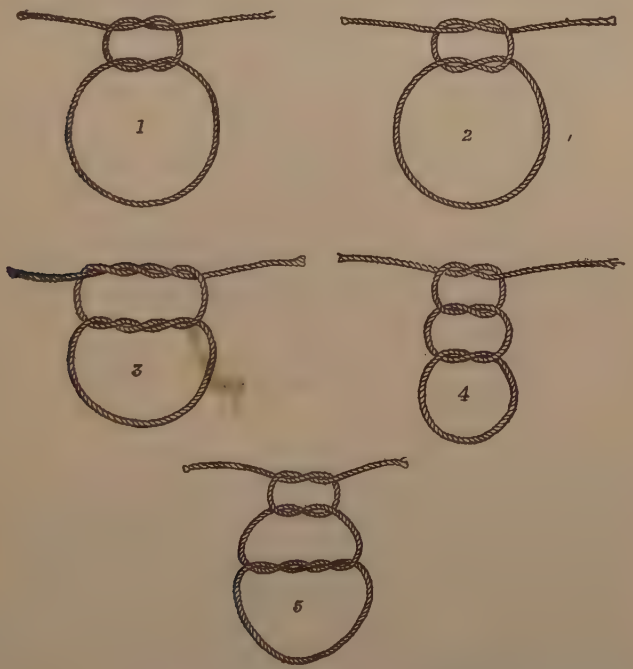

FIG. 158.—1. A "granny" knot; very liable to slip, especially in catgut. A knot to be avoided, *always*. 2. A square or reef knot; secure against slipping in silk or Pagenstecher thread; but not in catgut unless a third tie is added. 3. The double surgeon's knot. A very safe knot, very unlikely to slip, but too bulky to be used in the wound. 4. Three square knots; the ideal knot in wounds; gives a maximum of safety with a minimum of bulk. 5. Surgeon's and square knots; to be preferred in tying the broad ligaments, because the surgeon's knot prevents slipping until the second knot is tied.

as sold in all department stores, is just as good as the much more expensive Pagenstecher, and is available everywhere. It is sterilized in the same way as Pagenstecher thread or silk.

4. *Horsehair*, sterilized in the autoclave, is used for skin sutures only, has no advantage over Pagenstecher thread and is in many respects inferior.

5. *Silkworm-gut* is the best of the permanent suture materials, but it is never used for ligatures. It is the gut of the silkworm, and is best in strands ten to twelve inches long. Longer than this it is too thin for tension sutures. It is sterilized in the autoclave or by boiling in plain water, never in soda solution. It does not withstand repeated sterilization, but becomes brittle.

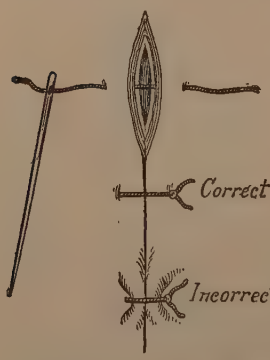

FIG. 159.—The right and wrong way to tie interrupted skin sutures.

Neither silk, linen thread nor silkworm-gut should be boiled in soda solution, as they are all made brittle.

Absorbable.—1. *Catgut*, prepared from the submucous layer of the intestine of the sheep. It is used in three forms chiefly: (1) Plain, not hardened to resist absorption; (2) iodized, hardened with iodin; (3) chromicized, hardened with bichromate of potassium solution.

It is difficult to sterilize, hence it is best to use the commercial product, rather than attempt home manufacture. Commercially it is put up in tubes that can be resterilized by boiling, and which are much the best.

The non-boilable tubes contain catgut which has not been dehydrated, is flexible and much inferior to the boilable kind. The latter is harsh and stiff, but can be made pliable if the strand is dropped in hot water for *ten seconds only* after the tube is broken. Longer immersion than this renders the gut elastic and slippery.

Catgut sizes are oo, o, 1, 2, 3, and 4. Sizes oo and o are used for fine sutures and small ligatures; size 1 for all ordinary suturing; size 2 for ligation in pelvic operations. Size 3 is

useful in perineal and cervical repair. Size 4 is too heavy for any ordinary use.

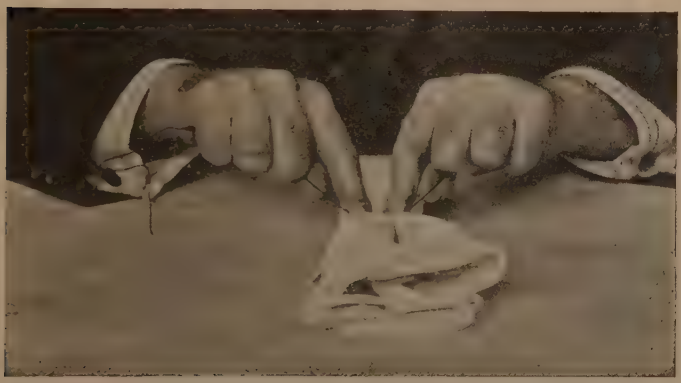

FIG. 160.—Proper way to tie a knot when tying deep in the pelvis. The forefingers are close down on the knot, and the strand is never jerked.

FIG. 161.—Proper way to tie a knot when tying near the surface. The thumbs are close to the knot, which is tied down by steady pressure and never jerked.

In using catgut, use small sizes in preference to large, tie knots with the thumbs close to the knot, with a steady pull

and never a jerk. Tie the second knot just tight enough to hold the first and always a third knot on top of that. Never tie with the stitch crossed, so that it can break. Improper tying is the commonest cause of broken strands, especially when it breaks at the second knot. The knot is the hardest and last part to absorb, hence the value of small sizes.

Durability of catgut is spoken of as its duration by days,

FIG. 162.—Wrong way to tie a knot. The hands are far away from the knot, and the strain in the strand of ligature material is excessive.

buried in the fascia. Hence we speak of ten-day gut and so on. Plain catgut is quickly absorbed, five to six days at the latest. In the vagina, rectum and peritoneum, catgut will last only one-third of the time the same gut will last in fascia.

Catgut is an almost ideal suture and ligature, provided it is not used in too large sizes, is not infected, and is not used unsupported by suitable permanent suture material where it is under heavy strain.

Home Preparation of Catgut.—Bartlett's method is: (1) Catgut is wound in small coils, which are suspended by threads in a large beaker, the ends of the threads being brought through a pasteboard cover of the beaker. This covering has an opening, admitting a thermometer, the bulb of which is on a level with the topmost coil. The coils must not touch the sides of the beaker; (2) the catgut is covered with albolene and the

whole gradually raised to 212°F. over a cumol bath and kept there twelve hours; (3) the temperature is then increased to 300°F. for one hour, and the oil allowed to cool; (4) the coils are picked up with sterile forceps, and kept in 1 per cent. solution of iodin in Columbian spirits.

2. *Kangaroo tendon* is obtained from the tail of the kangaroo. It is prepared in the same manner as catgut, it resists absorption longer than catgut, has greater tensile strength, but except in abdominal hernias, has no advantage over catgut.

3. *Aluminum bronze wire* differs from ordinary wire in that it is ultimately absorbed. It is flexible, ties easily and is used in large abdominal hernias, where tensile strength and durability are required. It is sterilized by boiling.

VIII. **Hand Disinfection.**—There is no quick and easy method of hand disinfection. All methods depending upon antiseptics are unreliable and very hard on the skin. The following method is satisfactory:

(1) Scrub hands and forearms, using tincture of green soap and hot running water, for ten minutes by the clock with a moderately stiff sterile brush. Particular attention is paid to the nails, which must be smooth and trimmed short; the spaces between the fingers, and to see that each hand gets an equal amount of scrubbing. (2) Scrub for one minute, with a fresh sterile brush, in 70 per cent. alcohol. (3) Rinse hands in sterile water and dry on a sterile towel. Rubber gloves are always worn, for every operation. They are sterilized by fractional method in the autoclave, or by boiling (flat and never rolled) wrapped in gauze or a towel. The hands should be just as carefully prepared as if gloves were not to be used.

IX. **Disinfection of the Abdominal Skin.**—There is no quick and easy method. All rapidly antiseptic solutions are irritating and undependable. It is easy enough to secure favorable healing in any method of preparation, when it is remembered that the skin of persons with cleanly habits will in most cases heal kindly without any preparation at all. A reliable and safe method is that described in paragraph 1.

Tincture of iodin particularly is objectionable for the following reasons: (1) In strengths of less than 12 per cent. it will not sterilize animal skin; (2) it is intensely irritating to the peritoneum and is always carried in on the operator's gloves, during the operation; (3) wherever the intestines are brought out of the wound and come in contact with the skin, there are areas of intense irritation on the visceral peritoneum; (4) it is a prolific cause of postoperative adhesions and a not infrequent cause of intestinal obstruction; (5) tincture of iodin in strengths sufficient to have a real antiseptic action on the skin, will cause serious desquamation.

At every section the abdominal skin should be protected with rubber dam, as the hands are with rubber gloves.

X. **Antiseptic Solution.**—The best surgeon, in abdominal work, is one who leans away from antisepsis, toward asepsis. Hence the best solution is plain sterile water. For superficial use the best antiseptics are 1 per cent. formalin solution or 70 per cent. alcohol, or lysol solution (1 per cent.). Bichlorid of mercury solutions are useless. Antiseptics of any kind are best kept out of the abdomen.

XI. **Anesthesia** for plastic operations is by gas and ether, chloroform or gas and oxygen. The latter is very satisfactory, especially for operations of short duration, but requires considerable skill in the handling of the apparatus. The safest of all inhalation anesthetics is unquestionably ether, though chloroform is very satisfactory provided it is pure, freshly opened, never given in the presence of an open flame (because of chlorin degeneration) and never pushed or hurried. Fat persons do not stand chloroform well, as a rule, and are more liable to chloroform poisoning.

For abdominal sections, gas and oxygen is not as a rule satisfactory, particularly in those requiring work deep in the pelvis. It is difficult or impossible to secure the necessary relaxation. In cases where general anesthesia is contra-indicated; age, bad kidneys, bad heart, diabetes, etc., various forms of local anesthesia are used.

In operations on the cervix the following is exceedingly useful, whether for repair or anterior vaginal hysterotomy:

The solution used is ¼ of 1 per cent. novocain (1–400) with fifteen drops of 1–1000 adrenalin to each ounce. The injections are made: (1) Around the cervix, at the point of attachment of the vaginal mucosa, at 12, 3, 6, and 9 o'clock, considering the cervix as a clock face. (2) At 3 and 9 o'clock straight into the cervical muscle, parallel to the

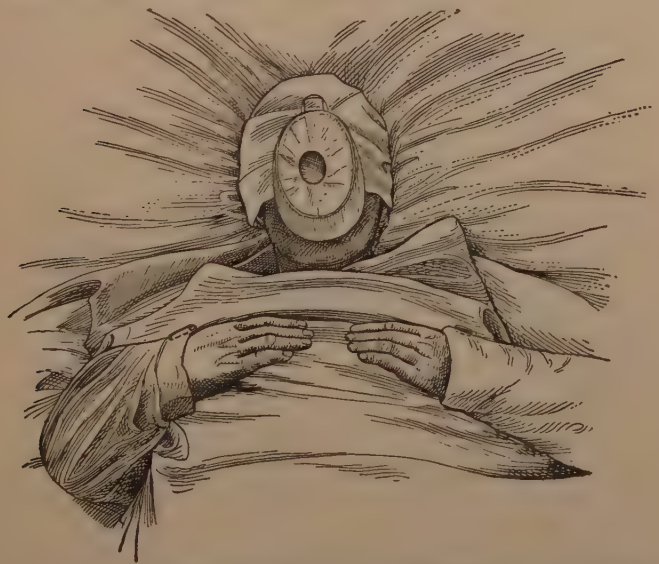

FIG. 163.—Safe position of the arms in anesthesia. (*After Crossen.*)

cervical canal. The operation can be begun five minutes after injection. Perineal nerve blocking is rarely successful, and there is no satisfactory method of local anesthesia for plastic operations on the vagina and perineum.

In abdominal sections, the skin and peritoneum are the two regions to be infiltrated. The same solution is used (1–400 novocain) and the length of incision in the skin is infiltrated with a succession of wheals; this is considerably simplified if a line is painted with tincture of iodin to represent the

incision. Once through the skin, the layers can be incised until the peritoneum is reached. This is infiltrated, and then opened. The abdominal viscera can be handled with impunity, *provided the mesentery and broad ligaments are not pulled upon.*

Quinin and urea-hydrochlorid is not a satisfactory solution for infiltration anesthesia. It causes considerable induration of the tissues and interferes with the healing of the wound.

Position of the Arms in Anesthesia.—The arms should be arranged so that the palms of the hands lie flat on the pectoral

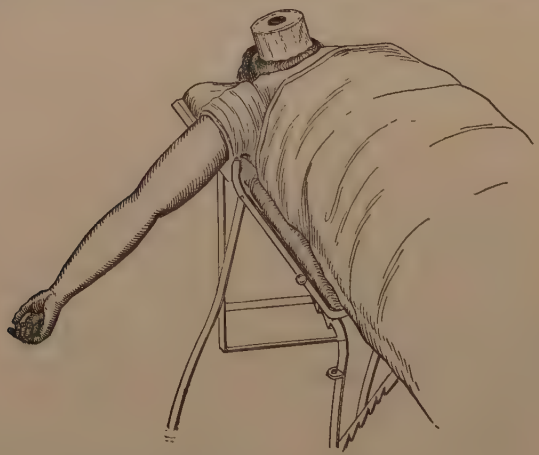

FIG. 164.—Dangerous position of the arm in anesthesia, causing musculospiral paralysis. (*After Crossen.*)

muscles, near the midline of the chest. They are secured by a six-inch bandage looped around one wrist going behind the neck and looped around the other wrist. Pinning the sleeves of the nightgown to hold the arms is not satisfactory as the pins are pulled out if the patient strains. The hands should not be placed under the patient's hips, nor should the arms hang down even for a short time over the edge of the table. This often results in a troublesome musculospiral paralysis. Also the arms should never be stretched up higher than the

patient's shoulder level, thus causing strain on the brachial plexus.

Spinal anesthesia is not a safe method.

Infiltration anesthesia is much better.

XII. **Instruments** in general are best sterilized by boiling for fifteen minutes in 1 per cent. sodium bicarbonate solution. Knives are sterilized by soaking in 10 per cent. carbolic acid in alcohol, as boiling destroys the edge. Instruments, like bougies, which cannot be boiled, are sterilized by soaking,

FIG. 165.—Dangerous position of the arm in anesthesia, causing strain in the brachial plexus. (*After Crossen.*)

wrapped in gauze, for at least an hour in *cold* 1–50 formalin solution, or 1–100 bichlorid.

The following instruments are those required, as a minimum, for plastic operation and for abdominal sections.

ABDOMINAL SECTION

3 knives
Plain and toothed tissue forceps
Curved and straight scissors

18 hemostats
12 curved hemostats or clamps
Self-retaining abdominal retractor
Hand retractors
Sponge forceps
Somers' clamp (for uterus)
2 curved ovariotomy needles (pedicle needles)
Sewing needles
Intestinal needles with silk or linen thread
Needle-holder
Rubber-covered clamps for intestinal resection
Cautery (for appendix, intestine or uterine stump)
Catgut, silk, silkworm-gut, linen thread.

PLASTIC OPERATION

Weighted speculum (Auvard)
3 double tenacula
Small uterine dilator (Goodell)
Heavy uterine dilator (Wathen)
Sims' curet
Martin curet
Placental forceps (Emmet)
Dressing forceps (Thomas)
Uterine sound
Bozemann intra-uterine douche
Scissors curved and straight
Tissue forceps, plain and toothed
18 hemostats
2 knives
Gelpi perineal retractor
2 lion-jawed forceps (Jacobs)
2 lateral vaginal retractors
Sutures (catgut and silkworm-gut)
Shot and shot-compressor (if used)
Needles and needle-holder.

XIII. The Abdominal Wound.—In pelvic surgery, the straight central incision is much the best. There is no advantage in the right or left rectus incision. The curved incisions across the lower abdomen (Pfannenstiel or Bardenheuer) have the single questionable advantage of invisibility

of scar, as it is hidden in the pubic hair. They have the following disadvantages: (1) Danger of injury to the bladder; (2) traumatism to the abdominal muscles, as the fascia flap is dissected up; (3) limited room for work, unless a huge incision is made; (4) a badly adherent appendix is almost impossible to remove through them; (5) deep-seated hematomata, under the fascia, cause wound infection and drainage weeks after apparent satisfactory closure.

The following points are to be remembered.

(1) Make a small incision, to be increased later if needed; (2) open the peritoneum high up, to avoid the bladder, and then enlarge opening downward; (3) make sure no intestine is cut when peritoneum is opened; (4) keep fingers out of wound as much as possible, and handle with forceps, but do not use forceps to pick up intestine or other viscera; (5) avoid bruising with retractors; (6) never bury catgut heavier than number 1 in the abdominal wound; disregard of this is the commonest cause of wound infection; (7) be sure of hemostasis, especially in the muscle (under it) and fat layers, otherwise a hematoma will form. This is the second cause of wound infection; (8) handle tissues gently and do not tie sutures tight enough to strangulate. Accurate approximation is all that is needed.

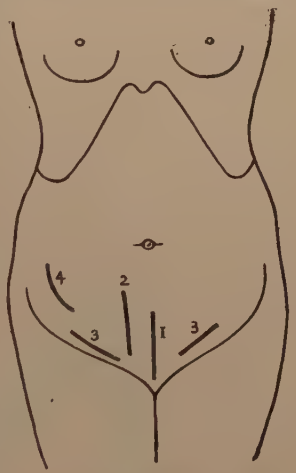

FIG. 166.—1. Central incision. 2. Right rectus incision. 3. Alexander operative incision. 4. Appendix incision.

Closure of the Abdomen.—(1) Continuous number 1 chromic catgut of the peritoneum, *everting the cut edges;* (2) two (at least, more if wound is long) silkworm-gut stitches to but not through the peritoneum; (3) two or three interrupted number 1 chromic catgut stitches in fascia: (4) continuous number 1 chro-

mic catgut stitch for the fascia; (5) if no silkworm-gut stitches have been used, and they are unnecessary in very short wounds, the fat is closed with a continuous number o plain catgut stitch just tight enough for approximation. This stitch is unnecessary when silkworm-gut stitches are used; (6) subcuticular stitch of linen thread; (7) tie silkworm-gut stitches, so that the knot is to one side. Tying them over a gauze roll is not secure enough.

Dressing of the Wound.—The wound, when closed, is washed

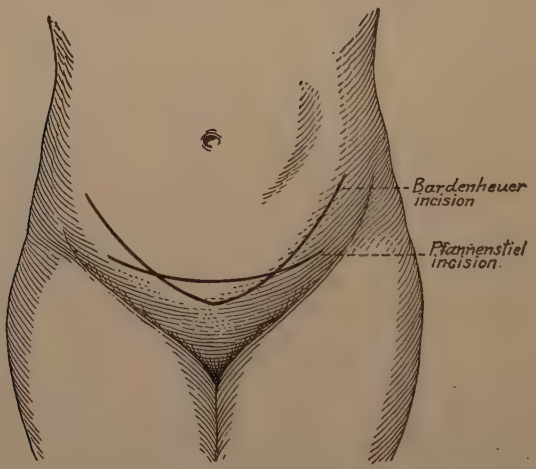

FIG. 167.—The transverse abdominal incision.

with 70 per cent. alcohol, and dried. Three strips of 1 inch gauze bandage are placed on it, and sealed down with collodion. This is in turn thickly dusted with sterile talcum powder, and covered with gauze and strips of adhesive plaster.

The outer dressing is removed in six hours, leaving only the collodion strips. An ice bag is then placed on the strips, to allay pain. The cold does not interfere in the least with healing and is most grateful to the patient. The collodion dressing is removed in two weeks, if there is no trouble in the wound.

The silkworm-gut and skin stitches are removed, and no further dressing is as a rule required. Infected wounds are described under the complications.

XIV. **Routine After-care of Sections.**—(1) Elevate head of bed on blocks twelve inches; (2) morphin sulph., gr. $\frac{1}{6}$, atropin sulph. gr. $\frac{1}{150}$—6th hour p.r.n.; (3) cool water p.r.n. in ounce quantities as soon as nausea ceases; (4) catheterize 6th hour p.r.n.; (5) continuous enteroclysis, for first twenty-four hours, of glucose $1\frac{1}{2}$ ounces, sodium bicarbonate $1\frac{1}{2}$ ounces, water 2 pints; run in at 110° F.—40 to 60 drops to the minute. The enteroclysis must be given through a large tube, with ample provision for the escape of gas; otherwise the fluid is expelled from the rectum and the method is useless; (6) if wound is *sealed*, take off outer dressing after six hours and put ice-bag over wound; (7) after twenty-four hours feed by albumin water, broth or milk and limewater equal parts, 1 to 2 ounces every hour; (8) after twenty-four hours give enema of milk of asafetida oz. 6, Hoffman's anodyne dram 1, water q. s. ad. 1 pint; (9) if much nausea wash out stomach by giving 2 glasses of water with 5 grains of sodium bicarbonate to each glass. If this does not stop it, wash out with tube; (10) after forty-eight hours give calomel gr. $\frac{1}{6}$ every hour for six doses, followed in two hours by flat magnesium citrate 6 ounces, divided into 3 doses, one hour apart; (11) after bowels move give soft diet, fifth day give light diet, seventh day give full diet; (12) if much distention, give eserin salicylate gr. $\frac{1}{40}$ hypodermically fourth hour, and pituitrin $\frac{1}{2}$ mil twice daily hypodermically; (13) if urine output low, give spartein sulphate gr. 1, hypodermically sixth hour and force water; (14) collodion dressing off fourteenth day, and wound dressed thereafter every other day with dry sterile gauze; (15) as a routine laxative use compound cathartic pills, one at bedtime. If too active give only half a pill. If griping, use A. B. S. & C. pill.

Routine After-care of Plastics.—(1) Morphin sulph. gr. $\frac{1}{6}$, atropin sulph. gr. $\frac{1}{150}$—sixth hour p.r.n.; (2) water p.r.n. first twenty-four hours; (3) irrigate perineal stitches with

sterile water four times daily, and also after each urination or bowel movement, and keep sterile vulvar pad in place

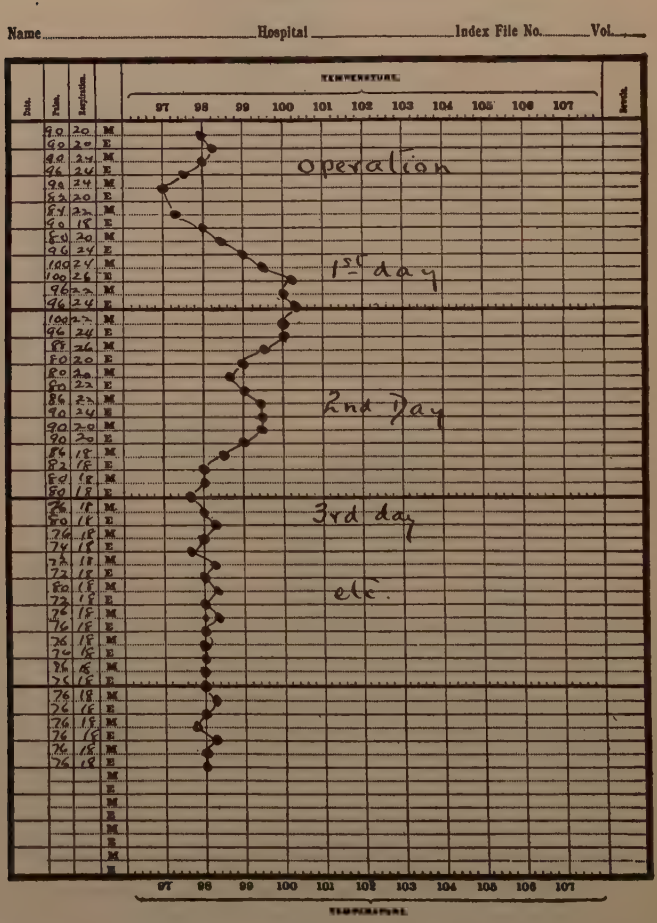

FIG. 168.—Average temperature and pulse chart after an abdominal section.

after irrigation; (4) if stitches soiled, clean with cotton on

applicator and peroxid of hydrogen, especially around the knots; (5) vaginal douche sterile water every day after fifth day; (6) simple enema once or twice in second twenty-four hours; (7) end forty-eight hours, calomel gr. $\frac{1}{6}$ every hour for six doses; (8) soft diet after first twelve hours, light diet fifth day, full diet seventh day; (9) catheterize eighth hour p.r.n.; (10) take out vaginal packing in twenty-four hours, *and note its removal on the chart;* (11) always note on chart the number of silkworm-gut stitches to be taken out, and whether they are vaginal, perineal, anal or rectal.

The chief complaint after plastic operations, aside from the pain of the perineal stitches is backache. This occurs after any vaginal operation and is due to the dorsal position on the table, which strains the sacro-iliac joints and coccygeal and other pelvic ligaments. The greatest relief is change of position in bed. It is unnecessary to have plastic operation cases lie on the back. They may turn to either side, and it is entirely unnecessary to bandage or tie the knees together. It is desirable to leave the vaginal and perineal stitches in place for some days after the patient is out of bed, to avoid the spreading strain on the perineum when the patient sits down.

XVI. **Stay in Bed.**—Cases with dilatation and curetment and repair of the cervix alone stay in bed for five days and leave the hospital on the seventh day. Ordinary plastics sit up on the fourteenth day and leave on the seventeenth. Cases of total prolapse stay in bed twenty-one days and leave in twenty-five. Ordinary sections stay in bed fourteen days and leave on the seventeenth. Cases of Alexander operation, abdominal or other hernia, Webster operation for diastasis of the recti and abdominal operation for retroversion of the uterus stay in bed twenty-one days and leave on the twenty-fifth. All these dates depend upon a smooth and uncomplicated convalescence.

Severe neuroses of long duration are liable to follow the too early getting up and getting about after abdominal opera-

tion, and the tendency unduly to shorten a patient's stay in bed—often strenuously urged by the patient herself—is to be avoided. Early getting up is said to prevent phlebitis, but this is most doubtful.

XVII. **Foreign bodies left in the abdomen** are most often a sponge or hemostat. Constant watchfulness is needed to prevent this accident. Sponges are counted and accounted for before the peritoneum is closed. All instruments are counted and checked up in the same way. The symptoms are severe and sometimes fatal infection, usually with a most persistent sinus, and a palpable mass. A metal instrument will show on an *x*-ray plate; the sponge will not. Either must be removed at the earliest date possible. Rarely a foreign body ulcerates into the rectum and is discharged spontaneously.

XVIII. **Reasons for leaving salt solution in the abdomen,** the solution being heated to 110°F. and poured in just before the peritoneum is closed are: (1) Relieve thirst; (2) prevent shock; (3) supply the fluid that the patient needs but often cannot take because of postoperative nausea; (4) prevent reforming of adhesions, by giving the peritoneum a chance to glaze over.

The plan is a good one and should be routine.

XIX. **Position in Bed after Operation.**—An abdominal section case is best kept flat on her back for at least forty-eight hours, with the head of the bed elevated twelve inches. At the end of this time she can be turned to either side, avoiding all sudden movements.

The *Fowler position* is most useful in all cases of abdominal infection, as it gravitates infectious fluids to the comparatively non-absorptive pelvis. The nearer the diaphragm, the more rapid is the absorption, hence the *foot* of the bed is never raised in peritonitis. In the Fowler position the patient is practically sitting up against a bed rest with the knees flexed over a pillow. The position is best secured on the Gatch folding bed. The foot of the bed is raised eighteen inches *only* in the treatment of shock and hemorrhage.

XX. **Enteroclysis.**—After every abdominal section and also prolonged plastic operation, continuous enteroclysis is desirable. The solution is glucose 1.5 ounces, sodium bicarbonate 1.5 ounces, sterile water 2 pints. It is run in at forty to sixty drops to the minute, at a temperature of 110°F. A faster flow than this makes it difficult for the patient to retain. If she does not retain it, it may be given high up, through a rectal tube, one pint twice daily. It relieves thirst, aids diuresis and is particularly desirable in drainage cases. Ample provision must be made for the escape of gas.

XXI. The indications for and the treatment of **drainage wounds** is described in Chapter VIII.

TREATMENT OF COMPLICATIONS AFTER OPERATION

Complications after Abdominal Sections

I. **Shock** is not common, after gynecologic operations, except those in which a very large amount of blood has been lost, such as extra-uterine pregnancy, very large tumors or operations in acute septic conditions.

The *symptoms* are: (1) Subnormal temperature; (2) pulse rapid and weak (but occasionally slow and intermittent); (3) pallor; (4) leaky skin with cold clammy perspiration; (5) shallow and irregular breathing; (6) pinched expressionless face; (7) pupils dilated and reacting slowly to light; (8) restlessness and air hunger, only if the shock is due to hemorrhage.

Delayed shock, after abdominal operations, coming on six to thirty-six hours after operation is almost always due to internal hemorrhage, except in operations for densely adherent pus tubes with drainage, where it is not uncommon without hemorrhage.

Differential diagnosis between internal hemorrhages and shock is often exceedingly difficult, as the symptoms are practically identical. The diagnosis can be made much more easily on paper than in practice.

Shock	*Internal Hemorrhage*
1. No restlessness	1. Restlessness marked
2. No air hunger	2. Air hunger marked
3. Patient apathetic	3. Patient anxious
4. No visual disturbance	4. Often loss of sight
5. Pulse rapid and small but not easily compressible	5. Pulse rapid, but larger and more easily compressible
6. Hemoglobin not lessened	6. Lessened, but not at first
7. No signs of fluid in flanks or Douglas' pouch	7. May be demonstrable

Whatever value this differential diagnosis possesses is only in the recognition of shock not due to hemorrhage. In doubtful cases where the patient shows no sign of reaction under treatment, it is wiser to re-open the wound rather than overlook hemorrhage.

Treatment.—Most cases can be avoided by the following: (1) As rapid operation as is consistent with good work; (2) good hemostasis; (3) gentle handling of tissues; (4) expert anesthesia; (5) careful covering of patient during operation and avoiding chilling or wetting.

Curative treatment can be summarized as external heat, stimulation, intravenous injection or transfusion: (1) Elevate foot of bed eighteen inches; (2) external heat by hot water bags or electric light frame; (3) bandage extremities, to drive blood to vital centers (autotransfusion); (4) hypodermic injection of digitalin gr. $\frac{1}{50}$, strych. sulph., gr. $\frac{1}{20}$ every three hours, or digipuratum 1 ampule instead of the digitalin; (5) hypodermic injection of atropin sulph. gr. $\frac{1}{100}$ repeated every four hours or often enough to control the leaky skin; (6) hypodermic injection of morphin sulph. gr. $\frac{1}{4}$ if very restless; (7) oxygen inhalation, if respiration labored; (8) enema of hot strong coffee 1 pint, brandy 1 ounce, given high up and not repeated; (9) if the shock is due to loss of blood, intravenous injection of salt solution 2000 c.c., given with a canula and not a needle (which is liable to perforate the vein) *after exposure* of the vein. Thirty drops of 1–1000 adrenalin solution are added as the fluid is running

in; (10) intravenous transfusion of blood is better postponed until the patient has reacted, as when given in a hurry, satisfactory tests of the donor's blood are often impossible and hemolysis may result; (11) artificial respiration, and oxygen especially if the shock appears suddenly during operation.

II. **Internal hemorrhage,** may be either *continuous* or *consecutive.* Continuous is a hemorrhage that never stopped at all; consecutive (the commonest) is one that comes on some time after the operation is completed, and due usually to a slipped ligature or breaking of adhesions following the withdrawal of a drain. It may come from any vessel, but is most often

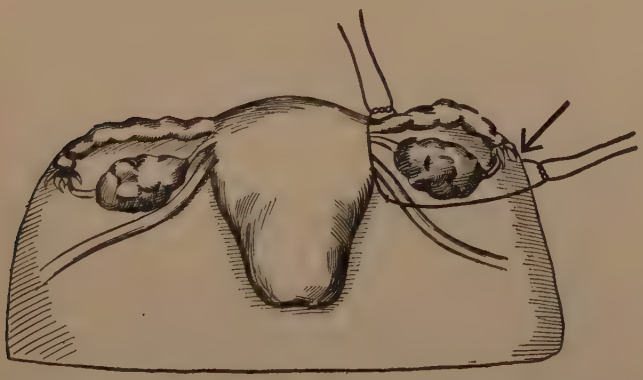

FIG. 169.—The arrow points to the commonest site of secondary hemorrhage after operations on the tubes, ovaries or broad ligaments. The edge of the broad ligament pulls out of the grip of the ligature, and the bleeding is from the ovarian artery.

from the ovarian artery, due to the outer edge of the broad ligament slipping out of the bite of the ligature.

Symptoms are precisely those described under the previous heading of "shock." A fairly full, increasingly rapid and compressible pulse, with restlessness and air hunger, usually means hemorrhage. The temperature, due to peritoneal irritation from blood-clots is often elevated and falls to subnormal

only when the case is desperate. The hemorrhage, unless from a small vessel, does not as a rule cease spontaneously.

Treatment.—Reopening of the abdominal wound and securing the vessel is the only treatment. The patient is put in the high Trendelenburg position, the intestines rapidly packed off, and the source of the bleeding sought at the outer edge of the broad ligament, where it will be found nine times out of ten. The broad ligament is retied, the clots and fluid blood sponged out and the abdomen rapidly closed. The after-treatment is the same as for shock.

Regeneration of Blood After Hemorrhage.—The body fluids are absorbed, to make up the loss in volume of blood—hence the thirst and scanty urine output. The red cells regenerate more slowly, hence at first the reds show a low count; the next phase is the rapid increase of reds, which outstrips the increase in hemoglobin, and gives a picture similar to chlorosis. The leukocytes are also increased. The regeneration of blood after acute hemorrhage is very rapid, provided the hemorrhage is not repeated.

III. **Abdominal distention** is seen most frequently in cases where there has been much handling of the intestines, as in pyosalpinx or extensive adhesions; in cases where there has been a sudden reduction in intra-abdominal pressure, as in large cysts, fibroids or in Cesarean section; in peritonitis; in intestinal paresis without peritonitis; and in intestinal obstruction. It is much more common in cases operated on without adequate preparation. It is often alarming in extent, but is not a serious complication unless the pulse is elevated, peristalsis is absent, and vomiting is persistent.

Treatment.—Prophylactic: (1) Proper cleansing of the bowel preparatory to operation; (2) gentle handling of the intestines as possible during the operation, and as little of it as possible; (3) eserin salicylate gr. $\frac{1}{40}$ hypodermically every four hours, pituitrin $\frac{1}{2}$ mil hypodermically twice daily in all cases where it seems likely to occur (fibroids, pus tubes, large cysts and Cesarean sections).

Curative Treatment.—(1) Rectal tube left *in situ* for several hours at a time; (2) calomel gr. 3 dry on back of tongue, followed by *flat* magnesium citrate solution 2 ounces every hour for four doses; (3) high enema of alum ½ ounce to sterile water 2 pints; (4) high enema quinin bisulphate ½ ounce to sterile water 2 pints; (5) high compound enema of magnesium sulphate ½ ounce, turpentine ½ ounce, glycerin 1 ounce, water enough to make 1 pint; (6) eserin salicylate gr. $\frac{1}{40}$ with strychnin sulphate, gr. $\frac{1}{40}$ every four hours hypodermically; (7) pituitrin ½ mil hypodermically twice daily; (8) if vomiting is persistent, wash out stomach and through tube give magnesium sulphate 1 ounce in water, 2 ounces, or 1 ounce of castor oil (hot).

If the abdominal distention and vomiting do not yield to the above, they are due to peritonitis or intestinal obstruction, both of which are described later.

IV. **Acute dilatation of the stomach** is a dangerous form of distention. It is most frequent in septic cases, but may occur in any case, nearly always in the first three days after operation.

Symptoms.—(1) The patient complains of pain in the epigastrium; (2) the pulse is rapid and weak, without demonstrable cause; (3) there is a marked globular tympanitic swelling in the epigastrium.

Treatment is prompt lavage, with the stomach tube, repeated as often as necessary to control the distention. In severe cases this may be every two or three hours. At the first washing, the patient should be given, through the tube, one ounce of magnesium sulphate. She is given eserin and pituitrin as described under distention of the abdomen.

Prognosis.—This is always a serious complication, demands prompt treatment, and if neglected may be fatal. A variety due to thrombosis of the gastric veins, is always fatal.

V. **Postoperative Vomiting.**—*Kinds:* 1. *Postanesthetic*, consisting of mucus and swallowed saliva, sometimes bile tinged, and usually, unless complicated by some other factor, of short duration.

2. *Acidosis* characterized by persistent vomiting, usually

beginning twenty-four hours or more after operation but often continuous from the postanesthetic kind; severe epigastric pain and acetonuria.

3. *Peritonitis*, where there is exteme and constant retching, but at first only a frothy mucus is ejected; later bile colored and finally coffee ground.

4. *Intestinal obstruction*, vomiting without effort, and of large amounts, first stomach contents, then bile and then stercoraceous. As a prophylactic measure, it is a wise plan in any case where there has been considerable mucus in the air passages during operation, to wash out the stomach before the patient recovers from anesthesia.

When the patient vomits after an abdominal operation, she is kept on her back, with the head turned to one side, to prevent inhalation of the vomited material. The vomit is best caught in a towel, rather than a basin. After plastic operations, the patient can be turned on her side, which makes her care easier.

Treatment depends upon the cause. Moderate cases will yield to the following:

(1) Absolute quiet, flat on back without a pillow; (2) small amounts of hot water (half an ounce at a time); (3) ice bag or spice plaster or mustard plaster to the epigastrium; (4) if persistent, give patient two glasses of water, with five grains of sodium bicarbonate to each glass, with the expectation that the water will be vomited promptly and hence wash the stomach out. If it is retained, it passes out through the pylorus and accomplishes the same purpose; (5) if still persistent, formal lavage with a tube, putting in one ounce of magnesium sulphate in strong solution before the tube is withdrawn.

Morphin, heroin and codein as sedatives usually prolong and aggravate the vomiting, as does cold water or cracked ice taken by mouth.

After the bowels move, the nausea usually disappears.

Cases of the *acidosis* type are promptly relieved by large doses of sodium bicarbonate, one dram to a dose, given every two or three hours.

Acidosis is a not infrequent complication after any operation, either plastic or section, where there has been prolonged anesthesia. It is more common in patients past thirty-five years of age, but is not infrequently seen in the young. It is characterized by severe vomiting, epigastric pain, considerable abdominal distention, marked stupor, and acetonuria. It is, except in very moderate cases, an alarming condition, often a very serious and sometimes a fatal one. The treatment consists in the administration of large doses of sodium bicarbonate by mouth, sixty grains every two hours being the minimum. The alkali can be given by bowel, in the proportion of one and one-half ounces of sodium bicarbonate to each quart of water, given by slow, continuous enteroclysis, forty drops to the minute. In very severe cases, time is a factor, and these cases can take nothing by mouth, nor retain anything by the bowel. Here the best results are gained by giving one pint of a five per-cent. solution of sodium bicarbonate solution intravenously, and repeating the dose once daily as long as the patient's symptoms demand it. This solution is sterilized as any other to be given intravenously, and the author has seen brilliant results from its use. Usually one dose is sufficient and three is the largest number he has had to employ.

Cases of *peritonitis* vomiting, unless controlled by the methods described above, are usually uncontrollable without operation. Intestinal obstruction requires operation.

Rectal feeding is often required, to give the stomach an absolute rest. The best enemas are: liquid peptonoids or predigested beef 2 ounces and salt solution (0.7 per cent.) or sugar solution 2 ounces, given every four hours. A nutritive enema should never exceed 6 ounces, and 4 are better. Peptonized milk or peptonized beef tea or broth may be substituted, but the predigestion should be carried to forty-five minutes. Twice daily a high enema of salt or sugar solution one pint should be given to relieve the thirst.

The sugar solution is glucose 1.5 ounces, sodium bicarbonate 1.5 ounces, water 2 pints.

VI. **Retention of urine** is common, due to a reflex nervous inhibition from pain. It is much more common in plastic operations than in sections.

Prophylaxis.—(1) Place patient on bed pan and irrigate vulva and perineum with hot sterile water; (2) pituitrin 1 ampule (1 mil) hypodermically and repeated in ½ mil doses twice daily for two days, if the inability to void persists for that long; (3) injection into the bladder of 1 ounce of 25 per cent. boroglycerid solution.

Curative treatment is catheterization under strict aseptic precautions, every eight hours until the patient is able to void.

Incontinence of urine is nearly always an overflow from retention. The bladder can be palpated as distended, and the relief is catheterization, followed by hypodermics of pituitrin ½ mil twice daily for three days.

VII. **Fever.**—The commonest cause of fever after abdominal section are: (1) Reaction, when the temperature occasionally reacts within twelve hours after operation to about 100°, and returns to normal line after about forty-eight hours; (2) ether pneumonia; (3) drainage cases, until the drain is removed; (4) peritonitis; (5) pelvic cellulitis, usually around a ligature in the broad ligament; (6) hematoma in Douglas' pouch, secondarily infected by colon bacilli; (7) phlebitis, (8) phlegmasia abla dolens, or milk-leg; (9) wound infection; (10) constipation.

As a rule a persistently high pulse rate, or a pulse which is weak or irregular is a much more grave sign than an elevation of temperature, which often occurs from trivial causes.

The rise in temperature following operation, often to 102° or 103°, is of no significance, as a rule, and requires no special treatment.

Ether pneumonia is usually a misnomer, the ether not playing the chief rôle in causing pneumonia.

Predisposing Causes.—(1) Elderly patients, who are particularly prone to the hypostatic type; (2) fat, short-necked

patients; (3) choking and vomiting under the anesthetic; (4) exposure to cold during anesthesia; (5) inexpert anesthesia; (6) administration of anesthesia to a patient with a bronchial cold; (7) tuberculosis; (8) operations for pelvic infection. Lung complications are much more common after sections than plastics. Most cases are pleurisy or bronchopneumonia; lobar pneumonia is rarer and also more serious.

The symptoms and treatment are those of bronchopneumonia, irrespective of the operation.

Drainage cases, if gauze has been used, often show fever from blocking back of discharge by the gauze drain. If this drain is loosened slightly, slightly pulled out, a gush of fluid often follows it, but the temperature is unlikely to subside completely until all the gauze is removed. The fever is rarely sufficient to justify haste in this respect.

Peritonitis is described under a separate head.

Cellulitis occurs in the connective tissue in the bases of the broad ligaments or in Douglas' pouch or between the uterus and bladder. Its symptoms and treatment are described in Chapter X.

Hematoma in Douglas' pouch is formed of blood that has oozed out slowly and collected here, in the most dependent portion of the peritoneal cavity.

It is usually secondarily infected by colon bacilli and is detected by bimanual examination as a hard, globular mass behind the cervix. In the majority of cases it does not suppurate, but undergoes resolution spontaneously, the process being hastened by four hot vaginal douches daily. If it suppurates, the posterior vaginal vault becomes convex, and boggy, the fever is persistent and there is considerable leukocytosis. In this case, it is opened by puncture of the posterior vaginal vault, and T-tube drainage, as described under pelvic abscess in Chapter X.

Phlebitis is discussed under a separate heading (11) in this chapter, together with its most common manifestation, milk-leg.

Wound infection is discussed on page 433.

VIII. **Constipation.**—The vast majority of patients require laxatives after operation, and usually in larger doses than they have been in the habit of using. Constipation is most common in patients with enteroptosis, weak and relaxed abdominal walls, and diastasis of the recti. In these the greatest difficulty is met in securing satisfactory movements.

The laxative most likely to be satisfactory is that which the patient has been in the habit of using, giving, however, about double her usual dose. Mineral oil is not as a rule sufficient, by itself, though a valuable aid to other medication. Long-continued use of saline cathartics is liable to be followed by considerable gastro-intestinal irritation and discomfort, and hence it is undesirable. Enemata must not be depended upon alone, as they cleanse only the rectum. Glycerin suppositories are practically useless.

In patients with weak abdominal muscles, enteroptosis or a long history of constipation can be benefited by strychnin sulph. gr. $\frac{1}{20}$ four times daily by mouth, or by eserin and pituitrin as recommended for distention. If constipation after operation is complicated by vomiting, the only practicable way of giving a cathartic is through the stomach tube: either magnesium sulphate, 1 ounce in strong solution or castor oil 2 ounces hot (to thin it) being poured in through the tube after lavage of the stomach.

IX. **Peritonitis** after operation is either local or diffuse. The symptoms begin on the second or third day, with persistent vomiting; rising temperature; rapid and thready pulse; steady abdominal pain, first in the lower abdomen and then diffuse; peristalsis is diminished, though there is usually passage of both gas and feces. Peristalsis is entirely absent only in diffuse peritonitis and late in the attack. Vaginal examination will reveal infiltration of the pelvic connective tissue, with its characteristic board-like hardness. The treatment of local and general peritonitis has been described in Chapter X.

X. **Intestinal obstruction** is most often seen after operation

for acute pelvic infection, especially in those in which drainage has been used, but may occur as a result of infection, inflammatory bands or improper technic of certain operations, notably ventrosuspension of the uterus.

Symptoms.—(1) Persistent vomiting; (2) increasing distention of the abdomen; (3) severe cramplike abdominal pains; (4) increasing pulse-rate; (5) no passage of either gas or feces, and no results from enema; (6) vomiting at first mucus, then bile and then stercoraceous.

Commonest Sites.—Obstruction occurs most in the rectum, at about the level of the pelvic brim; next in the sigmoid; next in the ascending colon; next in the eight inches of ileum nearest the caput coli, and next in any part of the small intestine, as a U trap. As these patients are usually very ill when re-operated on and as time is a very vital factor, it is worth while remembering these situations.

Treatment.—Prompt re-opening of the abdomen, eventration of the intestines and search for constricting bands. It must be remembered that there is often more than one point of obstruction, and the search should be thorough. Unless operation is promptly done, a secondary peritonitis develops, which is usually fatal.

Prognosis.—The case is always a serious one, but a fair number will be saved by prompt operation. The later the operation the higher the mortality.

XI. **Phlebitis,** in gynecologic operations, is usually of the septic nonpyogenic type, affecting the uterine and ovarian veins, and from there extending into the pelvic trunks and to the iliac and femoral. It is most common after operations involving considerable handling and ligaturing of the broad ligaments, such as operations for pyosalpinx, but can occur during the most uncomplicated convalescence from clean and simple operations.

Cause is obscure. It is probably a mild sepsis, due to nonvirulent bacilli, like the colon group, lodging in the inner coat of a vein and causing a local lesion with development of a thrombus. The exact mechanism is not known.

Symptoms.—(1) Deep-seated pelvic pain, without demonstrable lesion by vaginal examination; (2) moderate fever 101° average; (3) leukocytosis 12,000–14,000.

A constant moderate temperature, with moderate leukocytosis and no point of localization of infection points to a deep-seated pelvic thrombophlebitis.

Treatment is rest in bed, until the temperature has been persistently normal for seven days. It is claimed that if patients are gotten out of bed at the end of a week after operation that the danger of thrombophlebitis is greatly lessened, but this is very doubtful. Nothing further than rest can be done for a deep-seated phlebitis, but it is uncommon to have such a condition alone. The phlebitis seen most commonly is *phlegmasia alba dolens* or *milk-leg*. The left leg is the more commonly affected—rarely the infection is bilateral. The name milk-leg comes from the milky white appearance of the skin or from the old belief that all localization of infection in puerperal cases was due to metastasis of the milk—lactation being usually interrupted by the fever.

Kinds of Milk-leg.—(1) Cellulitic, due to infection of the connective tissue of the thigh; (2) thrombosis of the iliac and deep femoral veins—much the more common (98 per cent.).

Symptoms of Milk-leg.—(1) On the tenth to thirtieth day after operation the patient complains of severe pain in the calf of one leg, usually the left, and also in the corresponding groin; (2) the leg is almost immovable, and any movement gives intense pain; (3) the leg swells rapidly, the skin is tense and milk white, and usually pits deeply on pressure; (4) there is moderate fever, lasting for a short time, and subsiding long before the swelling shows any signs of decrease; (5) there is usually tenderness along the whole course of the femoral vein, which can be felt as a tender cord; (6) the swelling may begin in the groin and extend to the labium majus on the affected side; (7) the patient shows the usual signs of sepsis—depression, gastric disturbance, nausea and flushed cheeks.

In the cellulitic variety, the infection extends to the connect-

ive tissue of the thigh from the pelvic connective tissue, through the obturator foramina.

Treatment of Milk-leg.—(1) Absolute rest in bed; (2) elevation of the leg, on pillows or in a fracture box, at an angle of forty-five degrees. This does more to relieve the pain than any single point in the treatment; (3) evaporating lotions (lead-water and laudanum; or saturated solution of magnesium sulphate) covering the whole leg; (4) paint course of vein with 5 per cent. tincture of iodin or 50 per cent. ichthyol in glycerin —of doubtful value; (5) full diet and moderate stimulation; (6) no local massage.

The symptom urgently demanding relief is the pain in the groin. Ice bag to the groin, more rarely a hot water bottle, elevation of the leg and codein gr. ¼ or morphin sulph. gr. ⅙ hypodermically will give the greatest relief.

When the patient is out of bed, after the temperature has been normal for ten days, the swelling of the leg will often increase. This should be controlled by an elastic stocking, and no massage should be given for three months at least, and then very cautiously.

Dangers of Milk-leg.—(1) Pulmonary embolus; (2) pyemia; (3) gangrene.

Prognosis of milk-leg is guardedly favorable. The patient must remain in bed until the temperature has been uninterruptedly normal for ten days, as the greatest danger is pulmonary embolus, from too early getting up. Recovery may be complete, but convalescence is often prolonged, and a temporary or permanent lameness may result, about which the patient should be warned. Gangrene will demand prompt amputation, and is a very serious complication, as it is probably progressive. Extensive thromboses, even to the inferior vena cava, are not uncommon. In the cellulitic type, if long continued, elephantiasis is not unlikely, and suppuration is common. The most favorable termination is complete resolution, but is rarely attained. The next most favorable, and the commonest, is organization of the thrombus, obliteration of the

vein, and compensatory collateral circulation through the epigastric and gluteal veins, with frequent slight disability.

XII. **Embolism** is a constant danger of phlebitis, and also after operations for strangulated hernia. It is to be feared after operation for fibroid or any pelvic tumor with large dilated veins in the broad ligament, and is peculiarly frequent after appendectomy. The time of occurrence is usually late in convalescence, two or three weeks after operation, frequently after the patient is up and about. Postoperative emboli are most frequent in the lungs, but may occur in the brain, spleen, pleura, kidney and mesenteric vessels.

As they frequently follow phlebitis, sepsis plays a part in their cause, and the risk of embolism is greatly increased if the patient, with phlebitis, is allowed to move about before her temperature has been persistently normal for a week.

Pulmonary embolism is the greatest danger in phlegmasia. It is not likely to occur if the patient is kept quiet for a sufficient length of time. The clot may come from the femoral, iliac or uterine veins. A piece is broken off and carried by the circulation to the right auricle, right ventricle and pulmonary artery. Small emboli cause anemic infarcts and pleuropneumonia, and are not likely to be fatal, though a succession of them may be. The patient complains, without previous warning, of a severe pain in the chest and dyspnea. Her color is bad, she is obviously shocked, the heart is dilated and the pulse rapid, irregular and weak. If the embolus is a small one, active stimulation and oxygen will cause reaction in a short time. If the embolus is large the symptoms are all much more severe, and death is either instantaneous or so rapid that no time is given for any treatment.

Mesenteric emboli are found most frequently in the mesenteric veins of the transverse colon or in the gastric veins. The symptoms are those of intestinal obstruction or acute gastric dilatation. If the diagnosis can be made before the gut is gangrenous, operation, with resection if not too extensive, offers a chance of cure, but the condition is nearly always fatal.

XIII. **Infected abdominal wounds** are rare, with good technic, but will happen at times in spite of every precaution.

Causes.—(1) Contamination at the time of operation. This can be due to poor preparation of the skin, imperfect cleansing of the hands of the surgeon or his assistants, imperfect sterilization of instruments, sponges or suture material, infected material from pelvis or appendix, or from hair follicle infection, especially in groin wounds. (2) Bruising of tissue from rough handling, especially from retractors. (3) Poor hemostasis with consequent hematoma, one of the commonest causes of wound infection. (4) Ligatures tied too tight, so that the tissue is strangulated. (5) Too heavy catgut. Nothing heavier than number 1 chromic catgut should ever be buried in abdominal wounds, with the possible exception of incisional hernia cases, where the tension is extreme. (6) Fat necrosis. (7) Postoperative infection, due to dressings or improper handling.

It is common to speak of "catgut infection," but the gut is rarely to blame, unless it is home prepared. Tubes, put out by reliable manufacturers, which can be boiled with the instruments, are safe and sterile; those tubes which cannot be boiled but are "sterilized" by soaking in antiseptic solution are never safe, as the soaking will not sterilize them.

Type of discharge is serum, oil (from fat necrosis), blood or pus. Only the latter means an infected wound, as the first three cause no systemic disturbance.

Symptoms.—(1) Elevation of temperature; (2) leukocytosis; (3) throbbing pain in the wound; (4) brawny induration around the wound; (5) bulging under the skin; (6) as a late symptom, reddening of the skin.

In any case of fever, beginning three days or more after operation, the wound should always be suspected and inspected.

Treatment.—The prophylactic treatment is expressed by the opposites of the conditions mentioned as causes. Care in these respects will eliminate all but a very small percentage of infected wounds.

Curative consists in early opening, which should not be extensive. It is absolutely unnecessary to remove all stitches and allow the wound to gape. This only delays healing and ruins the appearance of the healed wound. A small opening, just sufficient to permit drainage and to allow the wound to be irrigated daily is all that is needed.

The best solutions for irrigation are: hydrogen peroxid one part, sterile water three parts, injected with a small glass piston syringe and washed out with 1–3000 permanganate solution followed by sterile water; Dakin's solution injected but not washed out after the solution returns clear; dichloramin-T, used in the same way as Dakin's solution.

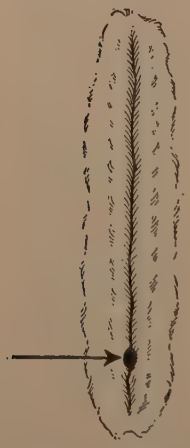

Fig. 170.—The position and comparative size of the opening for draining an infected abdominal wound. Removal of the stitches is unnecessary.

The irrigations are done daily, the small sinus is drained with a very small wick of rubber tissue, and the wound covered with gauze held by Montgomery straps. Under this the average wound will heal promptly and cleanly, in a week to ten days, and its appearance will be saved.

Frequently the whole skin and fat layers will gape; such a wound is cleansed as described, covered by a thin strip of gauze, the edges pinched together and held in apposition by adhesive straps. The dressing is changed daily, the straps being removed by pulling always *toward* the wound. If the fascia is involved as well, the wound must be secondarily sutured after it is clean, otherwise a hernia is unavoidable. Suturing it is not necessary if the fascia is intact.

Sinuses are usually due to foreign material in the wound, such as heavy catgut knots or particularly the silk or linen thread used in ventrosuspension of the uterus. Persistent sinuses of this type will not close until the offending

material is removed. It is not necessary to open the wound. A loop of silkworm-gut is passed down the tract to the bottom, is twisted around several times and withdrawn. A little persistence is usually rewarded by catching the stitch in the loop and withdrawing it.

Tubercular and cancerous fistulæ never close, and should not be operated upon.

A fecal fistula should be given a year to close spontaneously;

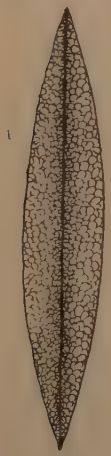

FIG. 171.

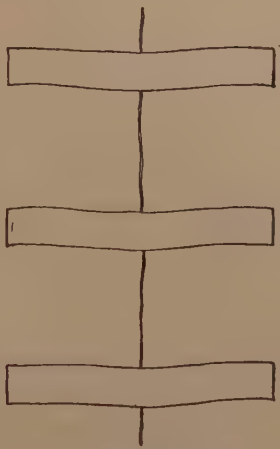

FIG. 172.

FIG. 171.—Separation of the skin and fat, as a result of superficial infection. The edges can be approximated neatly by adhesive straps.

FIG. 172.—A wound strapped with adhesive strips, after separation of the skin. The line of the wound is covered with a thin layer of gauze, which, for the sake of clearness, is omitted.

unless it is tubercular or cancerous, it may then be closed by operation, which is always serious, sometimes very extensive and to be attempted only after due consideration of its difficulties.

Danger of hernia in infected wounds is small unless the fascia gapes. Then it is sure unless the fascia is repaired by secondary suture.

XIV. **Bursting open of abdominal wound** sometimes occurs when only catgut has been used in suturing it.

Causes are: (1) Infection; (2) premature absorption of the catgut; (3) severe or constant muscular effort. The wound gaps widely and intestines bulge out under the dressings.

FIG 173.

FIG. 174.

FIG. 173.—A "stitch-fisher" made of a loop of silkworm-gut, tied on an ordinary wooden applicator. It is useful in extracting a buried stitch from the bottom of an infected sinus, as after ventrosuspension of the uterus. It must be boiled before use.

FIG. 174.—A "stitch-fisher" in operation. The loop of silkworm-gut is passed down the fistula, is twisted rapidly and withdrawn, often bringing the buried stitch with it.

The accident is not as serious as appearances would indicate, provided it is treated without delay.

Treatment is: (1) Light anesthesia, (2) closure of the wound,

without freshening the edges, with close-set interrupted silkworm-gut sutures; (3) insertion of a narrow rubber-dam drain to the peritoneum at the upper and lower angles; (4) the silkworm-gut stitches should not be removed for three weeks.

XV. **Low urine output** after operation is to be expected for the first forty-eight hours, the average being twelve to sixteen ounces in the first, twenty-four ounces in the second twenty-four hours. If it falls seriously below this the treatment is: (1) Continuous enteroclysis by Murphy drip, giving sodium bicarbonate 1.5 ounce, glucose 1.5 ounce to each quart of water; (2) free water by mouth unless the patient is seriously nauseated; (3) spartein sulphate gr. 1 hypodermically every four hours. The Murphy drip is discontinued as soon as the patient can take the necessary water by mouth.

XVI. **Bed-sores** are a constant danger in cases where there is continual vaginal, urine or fecal discharge. They should be prevented by proper care and cleansing.

If they occur, the best dressing is zinc oxid ointment spread thickly on lint, covered by a larger square of lint thickly covered with soap plaster.

XVII. **Incisional hernia** occurs in about 25 per cent. of drainage wounds. In ordinary infected wounds it is not to be feared, unless the fascia is attacked.

The diagnosis and treatment is described in Chapter XI.

Complications After Plastic Operations

These are not as common as after abdominal section, though some of them, as vomiting, intestinal paresis, phlebitis, retention of urine, are seen in both kinds of cases.

I. **Vaginal hemorrhage** is due to (1) Imperfect suturing; (2) imperfect hemostasis; (3) premature absorption of catgut. It is usually profuse, and accompanied by the passage of large clots. It may occur any time from a few minutes to four weeks after operation.

On examination the vagina is found filled with clots, which are best removed by douching, rather than sponging, as the

latter is exceedingly painful. When the vagina is distended by a wire bivalve speculum, under proper light, the source of the hemorrhage can be seen. It is most likely from (1) the angle of the cervical wound, in amputation of the cervix; (2) the angle of the perineal sulcus in perineorrhaphy; (3) the angle of the cervical wound in trachelorrhaphy; (4) the

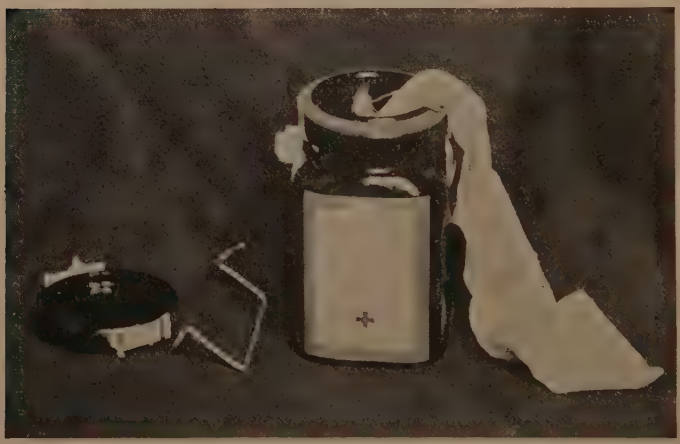

FIG. 175.—Uterine or vaginal packing; 5½ yards of four thickness gauze; 1½ inches wide; put up in the ordinary 1 yard iodoform gauze jar and autoclave sterilized.

anterior vaginal wall, in cystocele operation; (5) the uterine cavity.

Treatment.—Unless a large vessel is obviously spurting, which must be caught and tied, the best method of controlling the bleeding is as follows:

(1) With the patient on a table or bed, in the lithotomy posture, pull down the perineum gently with a narrow Sims speculum, or two fingers of one hand; (2) over the speculum or fingers, as a guide and protection to the perineal stitches, pack the vagina tight full of sterile gauze strip; using considerable pressure, and packing against the vaginal vaults; (3) put

a large vulvar pad of sterile gauze, held in place by a tight T-binder.

The hemorrhage may be severe enough to require active stimulation, as described in the treatment of internal hemorrhage.

II. **Hematomata** often occur, in the anterior vaginal wall and perineum, after plastic operations. They are globular swellings, attended by considerable pain and often elevation of temperature and pulse, and, in the perineum, with considerable discoloration of the skin of the perineum and buttocks.

They should be opened early, in the line of the stitches, to avoid suppuration, and are irrigated daily through a small catheter, with sterile water. They do not as a rule affect the result of the repair.

III. **Retention of urine** is common in all plastic operations, due to reflex action from pain. In interposition operations, the catheter may have to be used during the patient's entire stay in bed, as the obstruction is in these cases mechanical also.

In all plastic operations, when a catheter has to be used repeatedly, it is wise to give urotropin, ten grains four times a day, for the first three or four days. As a rule, the drug can then be discontinued, but if symptoms of cystitis appear, it must be continued. The treatment of cystitis is described in Chapter XIV.

IV. **Infection** is not common after plastic operations. When it occurs it is usually in the perineum, and due to some gross error in technic, or to perforation into the rectum, by one or more sutures, or to neglect of proper after-care.

Symptoms.—(1) Severe, throbbing perineal pain; (2) fever; (3) leukocytosis; (4) by palpation the hard globular indurated mass can be felt; (5) in severe cases there is profuse purulent discharge, gross edema of the labia and formation of false membrane. This latter in streptococcic infection only.

Treatment.—(1) Ordinary cases require only opening of the abscess, in the suture line and irrigation. They do not as a rule affect the result of the repair.

Streptococcic infection demands the immediate removal of all sutures, thorough disinfection of the infected area with carbolic acid (pure) followed by alcohol, and frequent vaginal irrigation. This is a serious and occasionally fatal accident and always ruins the repair.

V. **Perforation of the rectum by suturing** results in (1) Most commonly nothing at all; (2) infection and abscess localized around the puncture; (3) rectovaginal fistula.

Perforation of the bladder may result in a troublesome small vesicovaginal fistula, or the stitch may serve as a nucleus for a vesical stone; the so-called "wandering stitch."

Wounds of the bladder or rectum, made by accident in the course of an operation, are closed at once by chromic catgut sutures. The prognosis is favorable and fistula rarely results, unless the wound is infected.

VI. **Fistulæ** from stitch wounds or incised wounds in operations vary in size from a pinhead to an opening admitting several fingers. The very small ones are the commoner, because more easily overlooked.

The commonest fistula is rectovaginal, barely admitting a probe, annoying the patient by escape of gas, and fecal matter only when the bowels are loose. It does not as a rule close spontaneously.

Vesicovaginal or rectovaginal fistulæ, whatever their cause, are closed according to the methods described under the heading of Genital Fistula in Chapter XIII.

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